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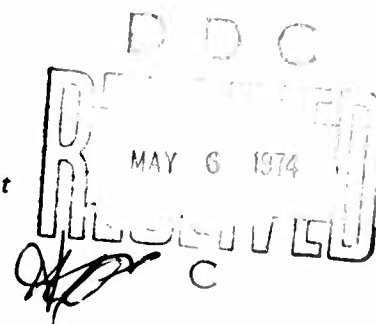
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# Effects of Release Interval for
# Stick Bombing on Probability of Kill

by

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# Naval Weapons Center

CHINA LAKE, CALIFORNIA 93555

# Naval Weapons Center

## AN ACTIVITY OF THE NAVAL MATERIAL COMMAND

## FOREWORD

The Naval Air Systems Command has initiated a program to investigate the feasibility of reducing the minimum release interval for stick bombing in the A-7E Operational Flight Program. The Naval Weapons Center was assigned the subtask of determining how much a reduced minimum release interval would increase the probability of kill against a variety of targets. The work was conducted over the period September 1972 to April 1973 under AirTask A510-5103/008-2/4235-000-143. This is the final report.

This report has been reviewed for technical accuracy by S. Robert Pfau and William B. Dykema. It is released at the working level for information only.

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(U) This report presents the effect, on the probability of kill, of decreasing the minimum release interval for sticks of Mk 82, 83, and 84 low-drag bombs. The effectiveness of a reduced minimum release interval is discussed as related to aiming error, quantity and type of bombs in the stick, and pairs versus singles releases. The methodology employed in the probability of kill calculations is explained.

# CONTENTS

# ACKNOWLEDGMENT

## NOMENCLATURE

| | |
|---|---|
| a | Ratio of $WR_r$ to $WR_d$ |
| AE | Aiming error in mils CEP |
| AGL | Above ground level |
| $B_d$ | Ballistic dispersion in mils standard deviation |
| CEP | Circular error probable |
| EMD | Effective miss distance |
| I | Impact angle |
| JMEM | Joint Munitions Effectiveness Manual |
| $L_{ET}$ | Effective target length |
| MAE | Mean area of effectiveness |
| MER | Multiple ejection rack |
| MRI | Minimum release interval |
| $N_B$ | Number of bombs in the stick |
| OFP | Operational flight program |
| P | Probability of damage from one bomb impact |
| $P_{HD}$ | Probability of damage given a hit |
| $P_{NB}$ | Probability of damage of individual bombs |
| $P_{ST}$ | Probability of damage from one stick of bombs |
| $P_K$ | Probability of damage of a stick of bombs averaged over many sticks |
| $R_{XAE}$ | Gaussian random number for range aiming error |
| $R_{XBD}$ | Gaussian random number for range ballistic dispersion |
| $R_{YAE}$ | Gaussian random number for deflection aiming error |
| $R_{YBD}$ | Gaussian random number for deflection ballistic dispersion |
| SR | Slant range from release to impact of each bomb |
| $SR_F$ | Slant range from release of first bomb to the target |
| TER | Triple ejection rack |
| $W_{ET}$ | Effective target width |

$WR_d$     Deflection weapon radius

$WR_r$     Range weapon radius

$X$     Total range displacement from the aim point of a bomb impact

$X_{AE}$     Component of X due to aiming error

$X_{BD}$     Component of X due to ballistic dispersion

$X_S$     Component of X due to stick position

$Y$     Total deflection displacement from the aim point of a bomb impact

$Y_{AE}$     Component of Y due to aiming error

$Y_{BD}$     Component of Y due to ballistic dispersion

$Y_S$     Component of Y due to stick position

$Z_F$     Altitude at release of the first bomb

$\sigma_{XAE}$     Standard deviation of range aiming error*

$\sigma_{XBD}$     Standard deviation of range ballistic dispersion*

$\sigma_{YAE}$     Standard deviation of deflection aiming error*

$\sigma_{YBD}$     Standard deviation of deflection ballistic dispersion*

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*Expressed as feet in the ground plane.

# INTRODUCTION

Attack aircraft often release a stick of bombs in a given pass over a target in order to maximize the probability of kill ($P_K$). Each release in the stick normally consists of a single bomb or pair of bombs. $P_K$ varies with the ground spacing between releases, and ground spacing varies with the time interval between releases. Heretofore, the minimum release interval (MRI) has been constrained due to hardware and safety limitations. Hence, $P_K$ may be limited by MRI.

As delivery accuracy improves, the optimum ground spacing (the spacing required for maximum $P_K$) decreases. The A-7E, with its improved delivery accuracy, requires closer spacing than older aircraft and its $P_K$ may be more restrained by MRI.

Investigations into the feasibility of reducing MRI have been initiated. The purpose of this report is to determine the sensitivity of $P_K$ with respect to ground spacing and thereby enable determination of the amount of increase in $P_K$ for anticipated reductions in MRI.

# SCOPE OF STUDY

This study encompassed Mk 82, 83, and 84 low-drag bombs, point and unitary land targets, releases in sticks of singles and pairs from parent and multiple racks, and release conditions in the neighborhood of 45-deg dive angle, 480 knots velocity, and 6,000 ft above ground level (AGL). It was presupposed that MRI would not generally limit the $P_K$ of area targets (an assembly of point or unitary targets). Aiming errors of 14, 10, and 6 mils circular error probable (CEP) and ballistic dispersions of 5 and 3 mils standard deviation were employed. The type and quantity of weapons and the loading configurations employed are appropriate to the A-7E, and are shown in Table 1. The symbology is identical to that in the A-7E Tactical Manual. The $P_K$ computations accounted for rack location and ground impact offsets in range and deflection for bombs released from shoulder positions on multiple and triple ejection racks (MERs and TERs).

TABLE 1. Loading Configurations Employed.

| NUMBER OF BOMBS | TYPE OF BOMB | STATION NUMBER | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 4 | MK 82,83,84 | ● | ● | | | | | ● | ● |
| 5 | MK 82,83,84 | | ● | ● | | | ● | ● | ● |
| 6 | MK 82,83,84 | ● | ● | ● | | | ● | ● | ● |
| 10 | MK 83 | ▽● | | ▽ | | | ▽● | | ▽● |
| 12 | MK 82 | ▽●▽● | | | | | | | ▽●▽● |
| 18 | MK 82 | ▽●▽●▽ | | ▽●▽ | | | ▽●▽ | | ▽●▽●▽ |
| 24 * | MK 82 | ▽●▽●▽ | ▽●▽●▽ | | | | | ▽●▽●▽ | ▽●▽●▽ |

* TWENTY-FOUR MULTIPLE RELEASES OF MK 82S FROM THIS LOADING CONFIGURATION ARE ONLY HYPOTHESIZED. CURRENT LOADING RESTRICTIONS ON THE A-7E PERMIT NO MORE THAN 20 MULTIPLE RELEASES OF MK 82S.

The $P_K$ computations assumed that the ground spacing selected by the pilot--the spacing before superimposition of bomb dispersion--remained constant between weapons or pairs of weapons. The A-7E Operational Flight Program (OFP) varies the release interval throughout release of the stick in order to maintain this spacing constant. For a given spacing, the release interval varies with normal acceleration and velocity of the aircraft during release of the stick. It will vary slightly even with constant normal acceleration and constant velocity, because of changes in position and velocity direction of the aircraft.

Only for very long sticks will changes in normal acceleration and velocity be large enough to significantly vary release interval. Figure 1 gives the relationship among release interval, spacing, and normal acceleration for one release interval centered at a 45-deg dive angle, 480 knots velocity, and 6,000 ft AGL. This relationship is sufficiently accurate to use for multiple releases in the neighborhood of the stated conditions.

If the release interval computed by the A-7E OFP is less than the MRI, the MRI is used as the release interval and this results in a larger spacing than was selected by the pilot. This spacing varies within the stick as conditions change, but the spacing corresponding to the average release conditions and to the MRI in Figure 1 is sufficiently accurate. The next A-7E OFP is expected to incorporate an MRI of 20 msec for parent-rack releases and 60 msec for MER/TER releases at normal acceler-ations exceeding 2 $g$. At less than 2 $g$, the MRI for MER/TERs increases at 93 msec/$g$. If a solid-state stepper switch is incorporated in the MER/TER, it is expected that the MRI can be reduced to at least 40 msec above 2 $g$.
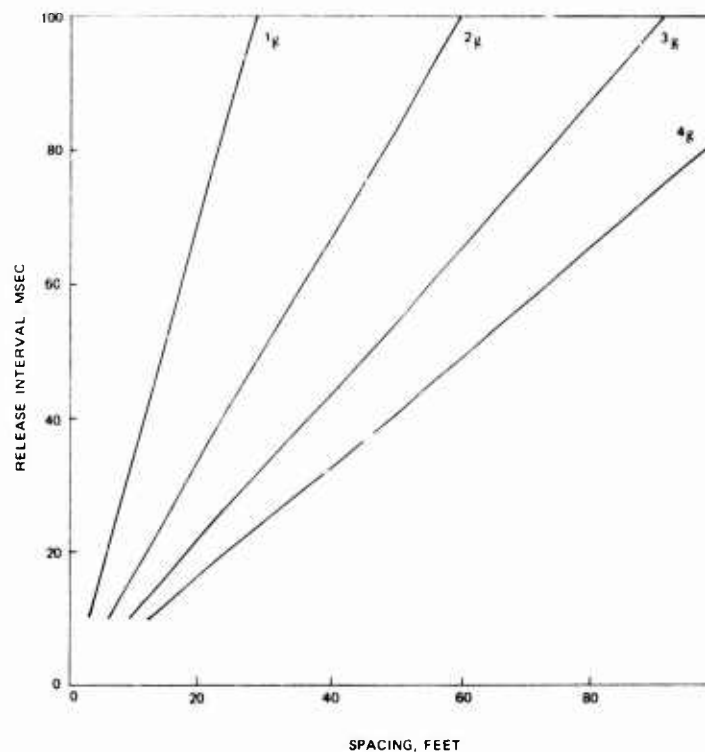


FIGURE 1.   Release Interval Versus Spacing and Normal Acceleration (at 45 deg/480 Knots/6,000 ft AGL).

# METHODOLOGY IN $P_K$ CALCULATIONS

The probability of damage to a target from one bomb (P) is a function of the impact position relative to the target, the weapon type, the type of fuzing, the target type, and the specified damage criterion. It has been determined empirically that the $P_K$ of general-purpose bombs against most point and unitary land targets can be treated by one of two damage probability functions. The constants in the functions are determined by the target, weapon, fuze, and specified damage criterion; they are a measure of weapon/fuze effectiveness against a particular target for a specified damage criterion.

One type of damage probability function is expressed in Eq. 1

$$P = \exp\left[-\left(\frac{X}{WR_r}\right)^2 - \left(\frac{Y}{WR_d}\right)^2\right] \tag{1}$$

where X and Y are range and deflection miss distances from the target, and $WR_r$ and $WR_d$ are range weapon radius and deflection weapon radius. $WR_r$ and $WR_d$ are dependent on weapon impact angle as well as the target, weapon, fuze, and specified damage criterion. $WR_r$ and $WR_d$ are reduced to two other convenient parameters, mean area of effectiveness (MAE) and "a", which are defined in Eq. 2 and 3.

$$MAE = \int_{-\infty}^{+\infty}\int_{-\infty}^{+\infty} P \ dx \ dy = \pi \cdot WR_r \cdot WR_d \tag{2}$$

$$a = \frac{WR_r}{WR_d} \tag{3}$$

MAE is dependent on the same factors as $WR_r$ and $WR_d$, whereas "a" is dependent only on the impact angle. From Eq. 2 and 3,

$$WR_r = \left(\frac{MAE \cdot a}{\pi}\right)^{\frac{1}{2}}$$

and

$$WR_d = \frac{WR_r}{a}$$

8

Hence, if MAE and impact angle are known, P can be computed by Eq. 1 as a function of impact position from the target. Values of MAE for combinations of target, weapon, fuze, damage criterion, and impact angle and values of "a" for various impact angles are listed in the Joint Munitions Effectiveness Manuals (JMEM) and other weapons effectiveness publications.

The second type of damage probability function considers P a constant within a rectangular area centered on the target and zero outside this area. The value of P within the rectangle is referred to as the probability of damage given a hit ($P_{HD}$). The dimensions of the rectangular area, $L_{ET}$ and $W_{ET}$, are the dimensions of the target extended by twice the effective miss distance (EMD). Figure 2 illustrates the makeup of the rectangular area. The values of $P_{HD}$ and EMD are determined by the target, weapon, fuze, and selected damage criterion, and are also tabulated in JMEM and other weapon effectiveness publications.
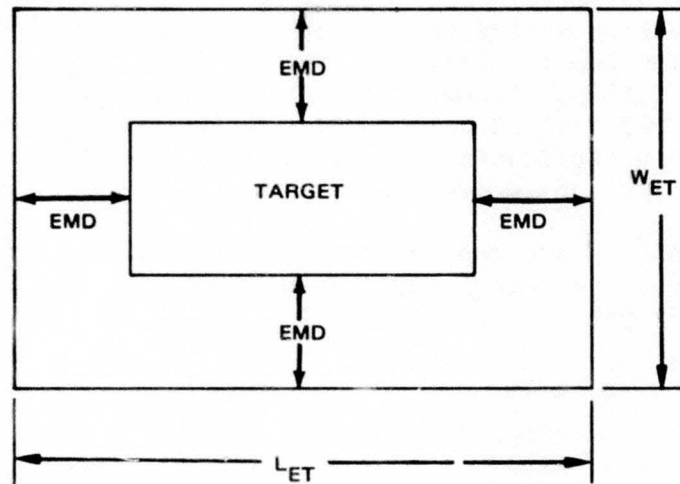


FIGURE 2. Effective Target Area, $L_{ET}$ x $W_{ET}$.

The damage probabilities of the individual bombs in a stick are assumed to be independent of one another. The probability of damage for an entire stick ($P_{ST}$) was computed by Eq. 4

$$P_{ST} = 1 - (1 - P_1)(1 - P_2) \cdots (1 - P_{N_B}) \tag{4}$$

where $P_1$, $P_2$ $\cdots$, $P_{N_B}$ are the damage probabilities of the individual bombs and $N_B$ is the number of bombs in the stick.

Using the Monte Carlo technique, the final probability of kill for any given stick, aiming error, and ballistic dispersion was computed by averaging $P_{ST}$ over many replications ($\sim$3,000) of releasing this stick. Each bomb in the stick for any given replication was displaced in the

ground plane from the aimpoint--which in this study was always the center of the target--in range (X) and deflection (Y) according to Eq. 5 and 6.

$$X = X_S + X_{AE} + X_{BD} = X_S + R_{XAE} \, \sigma_{XAE} + R_{XBD} \, \sigma_{XBD} \qquad (5)$$

$$Y = Y_S + Y_{AE} + Y_{BD} = Y_S + R_{YAE} \, \sigma_{YAE} + R_{YBD} \, \sigma_{YBD} \qquad (6)$$

$X_S$ and $Y_S$ are range and deflection components of the bomb's position relative to the center of the stick. $X_{AE}$, $X_{BD}$, $Y_{AE}$, and $Y_{BD}$ are displacements for range aiming error, range ballistic dispersion, deflection aiming error, and deflection ballistic dispersion. $\sigma_{XAE}$, $\sigma_{XBD}$, $\sigma_{YAE}$ and $\sigma_{YBD}$ are standard deviations for range aiming error, range ballistic dispersion, deflection aiming error, and deflection ballistic dispersion. The Rs are Gaussian random numbers, a set of which has a standard deviation of 1. The (X,Y) displacement of each bomb determined its value of P. $P_{ST}$ for that replication was computed by Eq. 4. $P_{ST}$ was averaged over at least 3,000 replications to yield a $P_K$ value with an accuracy of approximately 0.01 standard deviation.

Since $X_{BD}$ and $Y_{BD}$ are random for each bomb in a stick, a new pair of $R_{XBD}$ and $R_{YBD}$ values were generated for each bomb in a given replication. $\sigma_{XBD}$ and $\sigma_{YBD}$ for each bomb are given by Eq. 7 and 8

$$\sigma_{XBD} = \frac{B_d \cdot SR}{1,000 \cdot \sin I} \qquad (7)$$

$$\sigma_{YBD} = \frac{B_d \cdot SR}{1,000} \qquad (8)$$

where $B_d$ is ballistic dispersion in mils standard deviation, SR is slant range from release to impact, and I is impact angle. It is seen that $\sigma_{XBD}$ for each bomb varies with SR and I and $\sigma_{YBD}$ varies with SR. So $X_{BD}$ and $Y_{BD}$ are determined by the $R_{XBD}$, $R_{YBD}$, SR, and I values of each bomb.

All the bombs in a replication of a given stick have the same value of $X_{AE}$, and the value is that of the first bomb. This is because, once the first bomb is released, each succeeding bomb is released to impact one spacing ahead of the previous one. Consequently, $R_{XAE}$ and $\sigma_{XAE}$ have the same values for all the bombs. $\sigma_{XAE}$ is given by Eq. 9

$$\sigma_{XAE} = \frac{AE \cdot (SR_F)^2}{1,177.4 \cdot Z_F} \qquad (9)$$

where AE is aiming error in mils CEP, and $SR_F$ and $Z_F$ are the slant range and altitude from release of the first bomb to the target.

The A-7E OFP computes an azimuth solution continuously during release of the stick; therefore, if the pilot attempts to steer the azimuth solution throughout release of the stick, $Y_{AE}$ will vary with each bomb. The errors in the aircraft sensor inputs that are involved in calculation of the azimuth solution are assumed to remain constant during release of the stick. This assumption requires $R_{YAE}$ to be the same random number for each bomb in the stick. $\sigma_{YAE}$ is given by Eq. 10

$$\sigma_{YAE} = \frac{AE \cdot SR}{1,177.4} \tag{10}$$

where SR is the slant range from release to impact of each bomb.

The expressions for $\sigma_{XAE}$ and $\sigma_{YAE}$ given in Eq. 9 and 10 both assume that the range and deflection angular standard deviations of aiming error are equal. For the present A-7E system, this assumption is reasonably substantiated for the release conditions in this study by flight test data and error analysis paper studies. A deviation in this assumption is relatively unimportant, because this study was not so concerned with absolute values of $P_K$, but rather with the amount of $P_K$ change with change in $P_K$-dependent parameters.

In general, it can be expected that, as a stick of bombs varies in quantity, spacing, and normal acceleration, the release condition of each bomb (namely, its velocity vector and position) will change also. It was seen from previous discussion that the $\sigma_{XBD}$, $\sigma_{YAE}$, and $\sigma_{YBD}$ values of the bombs were dependent on their respective release conditions and that $\sigma_{XAE}$ was dependent on the release condition of the first bomb. Hence, $P_K$ is dependent on how the release conditions of the bombs in a stick vary with quantity, spacing, and normal acceleration.

There is no unique change in the release conditions of the bombs for a given change in quantity, spacing, or normal acceleration. The release conditions change according to how the individual pilot alters the pre-release flight path for the given change in quantity, spacing, or normal acceleration. It was found impossible to determine the most probable alteration of the pre-release flight path. However, possible ways to alter the flight path were considered. The one that seemed the most tactically realistic required all deliveries--regardless of the quantity, spacing, or normal acceleration--to have the same minimum pullup altitude. This criterion resulted in minimum change in the release conditions. The change was sufficiently small to allow the same release condition to be used for all the bombs in all sticks to calculate $\sigma_{XAE}$, $\sigma_{XBD}$, $\sigma_{YAE}$, and $\sigma_{YBD}$. This approximation gave sufficient accuracy in $P_K$, provided the longer sticks were dropped at normal acceleration of 2 $g$ or more and the shorter sticks at 1 $g$ or more. Since long sticks dropped at low $g$ are

tactically unrealistic, this approximation does not restrict unnecessarily the $P_K$ data. The common release condition was 45-deg dive angle, 480 knots velocity, and 6,000 ft AGL.

The $P_K$s of sticks of bombs were computed for representative values of MAE, $L_{ET}$, $W_{ET}$, and $P_{HD}$. The $P_K$ data are presented in the Appendix.

## DISCUSSION OF RESULTS

The primary factors that affect probability of kill are listed below into one of three groups (I, II, or III) according to their relative effect in improvement of probability of kill:

     I.   Reduction of aiming error

    II.   Decrease of minimum spacing
           Release in pairs vice singles
           Increase in the number of bombs
           Increase in bomb size

   III.   Variation of bomb dispersion
           Variation in loading bombs on MER/TER racks.

Although these factors are obviously interdependent, the primary emphasis in this discussion shall be how these factors relate to the minimum possible spacing.

Sticks of singles and pairs of bombs having the same number of bombs and stick length have the same $P_K$ values, provided the spacing of pairs does not exceed bomb dispersion in range by an order of magnitude. Consequently, the maximum $P_K$ values for sticks of pairs and singles are equal and the value for the stick of pairs occurs at a larger spacing than the value for the stick of singles. Additionally, the $P_K$ for spacings larger than the spacing at maximum $P_K$ for pairs is always greater for the stick of pairs than for the stick of singles. Figure 3 depicts the relationship of $P_K$ for sticks of singles and pairs. Since the MRI is the same for singles and pairs releases, the maximum available $P_K$ for release in pairs is normally greater than, but never less than, the maximum available $P_K$ for release in singles. Hereafter, discussion shall assume release in pairs.

A decrease in bomb dispersion generally improves the maximum available $P_K$ for smaller aiming errors, smaller bomb quantity, and harder or smaller targets. A decrease in dispersion from 5 to 3 mils generally effects an increase in $P_K$ from 0 to 0.05. Typical increases can be seen

from Table 2. The $P_K$ values given are the maximum available assuming a minimum spacing of 20 ft for four- and six-bomb sticks and 40 ft for sticks of more than six bombs. It is concluded that, for realistic cases, bomb dispersion has only a limited effect on $P_K$.

TABLE 2. Effect of Bomb Dispersion on Maximum
Available $P_K$ (Pair Releases).

| MAE[a] | Aiming error, mils | Bomb dispersion, mils | No. of bombs[b] | | | | | |
|--------|--------|--------|------|------|------|------|------|------|
| | | | 4 | 6 | 10 | 12 | 18 | 24 |
| 2,000 | 14 | 5 | 0.09 | 0.12 | 0.17 | 0.18 | 0.23 | 0.25 |
| | | 3 | 0.09 | 0.13 | 0.18 | 0.19 | 0.25 | 0.25 |
| | 6 | 5 | 0.25 | 0.35 | 0.35 | 0.35 | 0.37 | 0.37 |
| | | 3 | 0.30 | 0.40 | 0.41 | 0.38 | 0.39 | 0.37 |
| 20,000 | 14 | 5 | 0.48 | 0.58 | 0.71 | 0.74 | 0.84 | 0.86 |
| | | 3 | 0.50 | 0.60 | 0.72 | 0.75 | 0.84 | 0.85 |
| | 6 | 5 | 0.84 | 0.91 | 0.97 | 0.97 | 0.98 | 0.98 |
| | | 3 | 0.87 | 0.94 | 0.98 | 0.98 | 0.99 | 0.98 |

[a] Mean area of effectiveness.

[b] Minimum spacing: 20 ft for six bombs or less, 40 ft for more than six bombs.
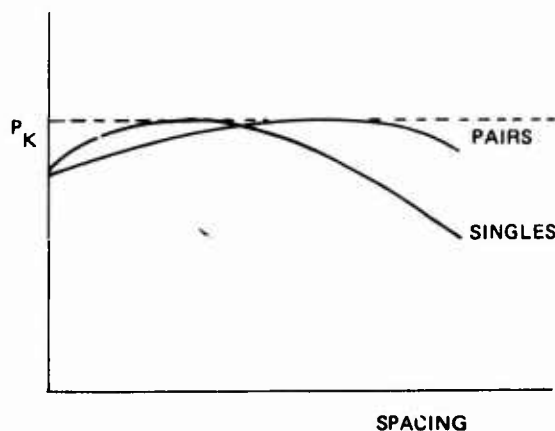


FIGURE 3. $P_K$ Versus Spacing Relationship Between Sticks of Pairs and Singles.

Variation in $P_K$ caused by changes in bomb loading configurations was examined and found to be small. Figure 4 shows four different configurations of eight Mk 82s, which represent the most extreme variation in impact patterns of allowable loading configurations on the A-7E. Table 3 gives the $P_K$ values for these configurations. This extreme case of impact pattern variation is seen to have only a small effect on $P_K$. It is concluded that loading configuration has a negligible effect on $P_K$.

TABLE 3. $P_K$ of Mk 82 Loading Configurations Shown in Figure 4.

Pair releases; aiming error = 10 mils; bomb dispersion = 5 mils; minimum spacing = 40 ft.

| Target | Configuration | | | |
|---|---|---|---|---|
| | I | II | III | IV |
| MAE = 10,000 sq ft | 0.60 | 0.60 | 0.62 | 0.61 |
| EMD = 50 x 50 ft $P_{HD}$ = 1.0 | 0.24 | 0.24 | 0.28 | 0.27 |
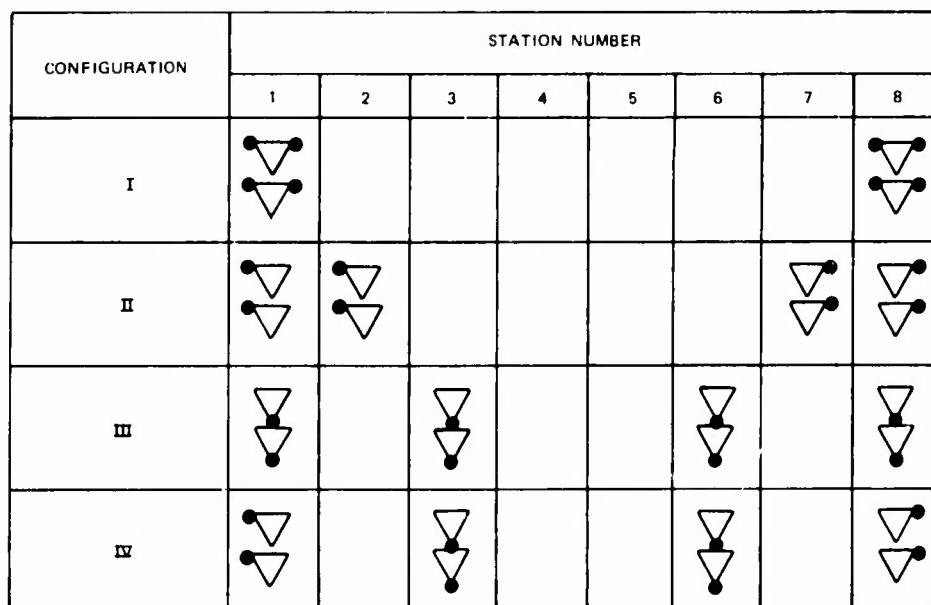


FIGURE 4. Schematic of Four Allowable Loading Configurations of Eight Mk 82 Bombs on the A-7E.

For sticks released in pairs against a given target, the four primary factors influencing $P_K$ are aiming error, minimum spacing, bomb quantity, and bomb type. The relationships among these four factors are portrayed in Figures 5 through 12. Each figure covers one effectiveness model for a hypothetical target. The target is given a likely value of the appropriate effectiveness parameter (MAE, EMD, or $P_{HD}$) for each bomb type (Mk 82, 83, and 84). $P_K$ values corresponding to these parameter values were interpolated from those given in the Appendix. Each figure has a plot each for 14- and 6-mil aiming errors.

Each plot includes a set of curves for each type of bomb. In each set there is a curve for each type of MRI mechanization. A 3.2-$g$ normal acceleration was assumed for each mechanization. Each curve represents the maximum available $P_K$ for that particular MRI and bomb type. The maximum available $P_K$ values for MRIs of 0 and 20 msec for parent rack releases are always equal; therefore, these two cases are represented by one curve. There are three curves for MER/TER releases, one for each of three postulated MRIs. The upper curve is for an MRI of 0; it is included as a limiting case to represent the maximum capability. The two lower curves are for MRIs of 60 and 40 msec and represent the capabilities for MER/TERs with the present electromechanical stepper switch and a representative solid-state stepper switch, respectively. From Figure 1 it is seen that the 20-, 40-, and 60-msec MRIs correspond to 20-, 40-, and 60-ft spacings at 3.2-$g$ normal acceleration. The loading configurations for the various bomb quantities used are given in Table 1. The maximum quantity listed in Table 1 for each type of bomb is the maximum quantity of that type that can be loaded on the A-7E.

Several conclusions can be drawn from Figures 5 through 12. They are discussed in the following paragraphs.

As mentioned previously for parent rack releases, an MRI of 20 msec yields the same maximum available $P_K$ as an MRI of 0. Hence, the 20-msec MRI, which had been planned for incorporation in the next A-7E OFP, represents the maximum capability for stick releases from parent racks.

The improvement in $P_K$ achieved through a reduced MRI for MER/TER releases increases as aiming error is decreased. A reduction in aiming error can be very effective in improving $P_K$, but only if the reduction is accompanied by a reduction in MRI. Reducing the aiming error from 14 to 6 mils without reducing the MRI often results in little $P_K$ improvement.

For MER/TER releases at a given MRI, the smaller the aiming error, the smaller the improvement in $P_K$ resulting from an increase in the number of bombs in the stick. For most targets, no increase in $P_K$ is effected by increasing the bomb quantity from 12 to 24 Mk 82s at an aiming error of 6 mils and an MRI of 40 msec.

At a 6-mil aiming error and a 60-msec MER/TER MRI, the $P_K$ achieved using six bombs from parent racks is very nearly as good as that achieved using two or four times as many bombs from MERs. For most targets and an aiming error of 6 mils, twenty-four Mk 82s released from MERs at a 60-msec MRI yield lower $P_K$s than six Mk 82s released from parent racks at a 20-msec MRI.

At small aiming errors, larger $P_K$s can be achieved by releasing Mk 83s or Mk 84s from parent racks at an MRI of 20 msec than by releasing a large quantity of Mk 82s or Mk 83s from MER/TERs. At an aiming error of 6 mils and for most targets, four Mk 83s released from parent racks at 20 msec yield at least the $P_K$ of twenty-four Mk 82s released from MERs at an MRI reduced from 60 to 40 msec. Five or six Mk 83s or four, five, or six Mk 84s would obviously yield an even higher $P_K$.
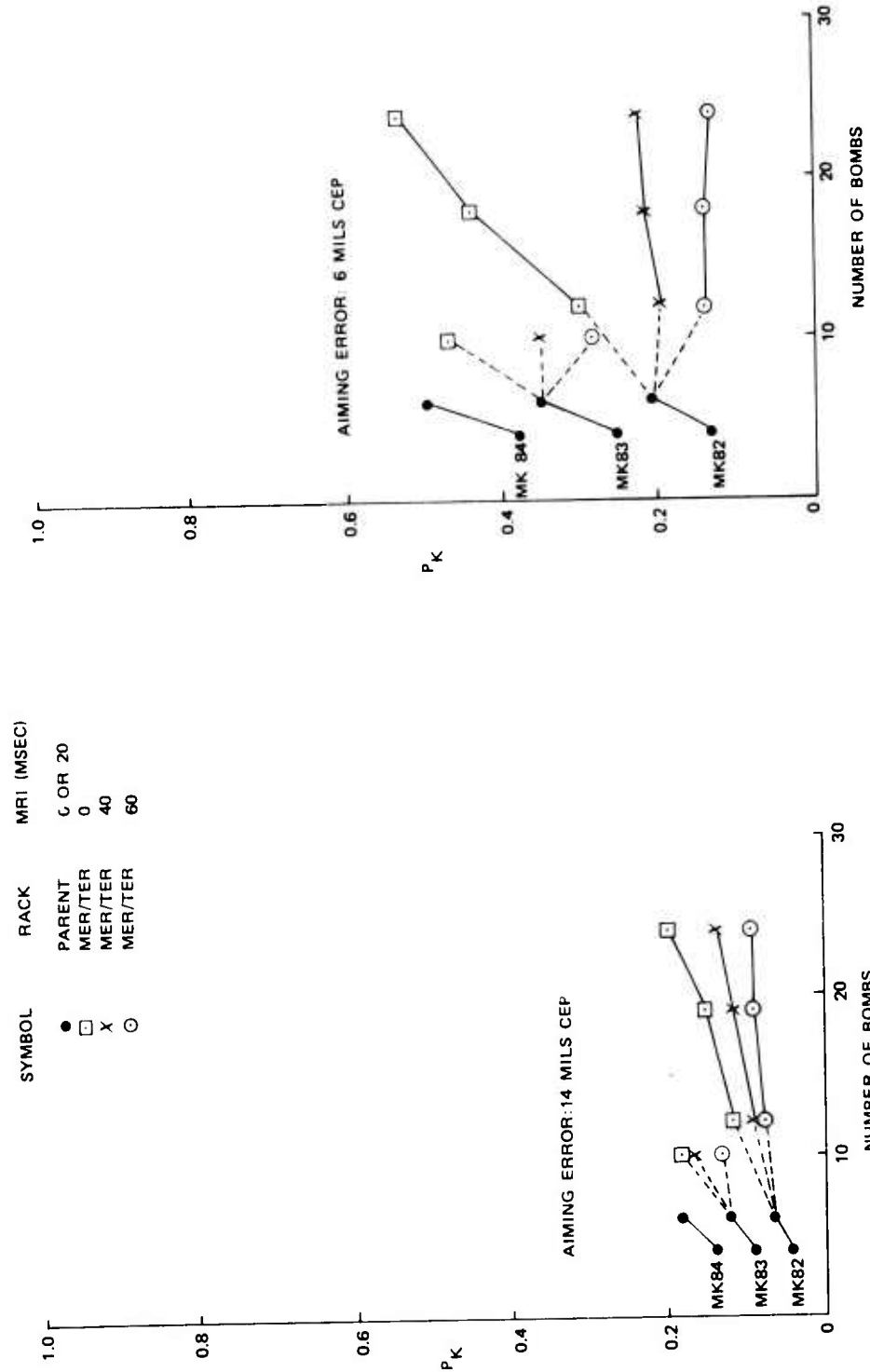
FIGURE 5. Relationship of $P_K$ With Aiming Error. Minimum Release Interval. Bomb Quantity. and Bomb Type. (Mean Area of Effectiveness. sq ft: Mk 82 = 1.000; Mk 83 = 2,000; Mk 84 = 3,500.)
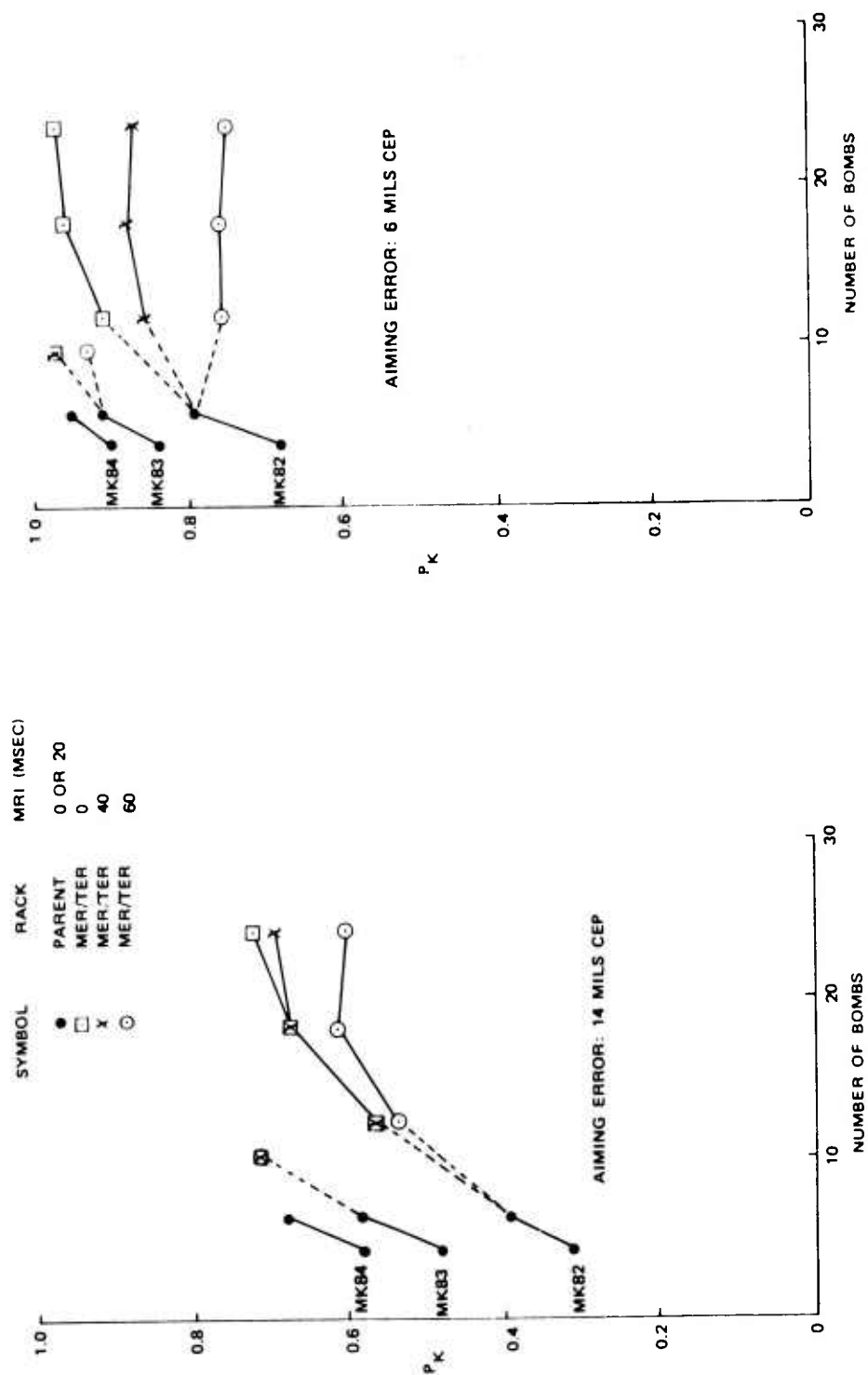
FIGURE 6. Relationship of $P_K$ With Aiming Error, Minimum Release Interval. Bomb Quantity. and Bomb Type. (Mean Area of Effectiveness. sq ft: Mk 82 = 10.000: Mk 83 = 20.000: Mk 84 = 30.000.)
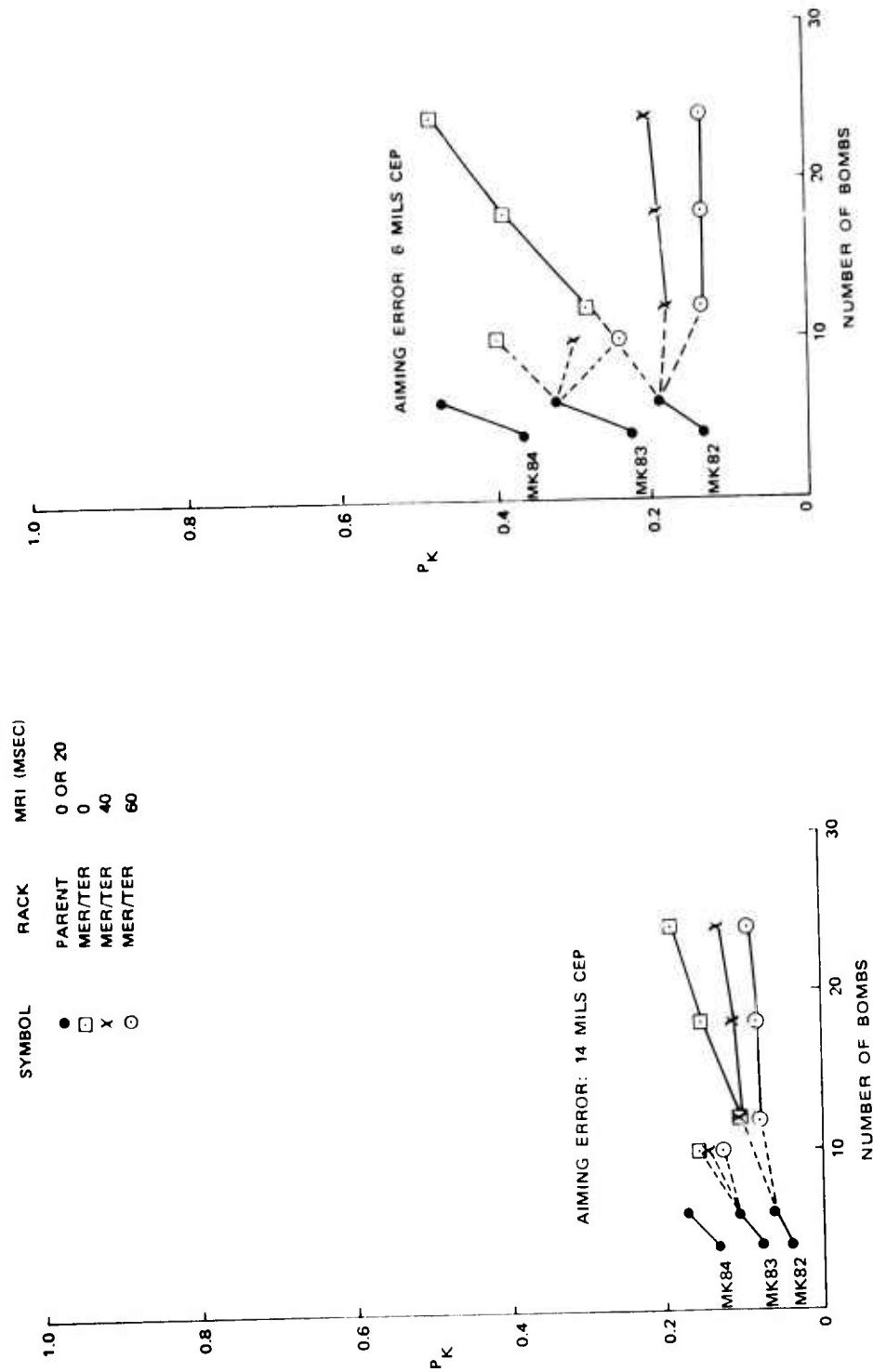
FIGURE 7. Relationship of $P_K$ With Aiming Error, Minimum Release Interval, Bomb Quantity, and Bomb Type. (LET x WET: Mk 82 = 30 x 30 ft; Mk 83 = 40 x 40 ft; Mk 84 = 55 x 55 ft; $P_{HD}$ = 1, attack parallel to LET or WET.)
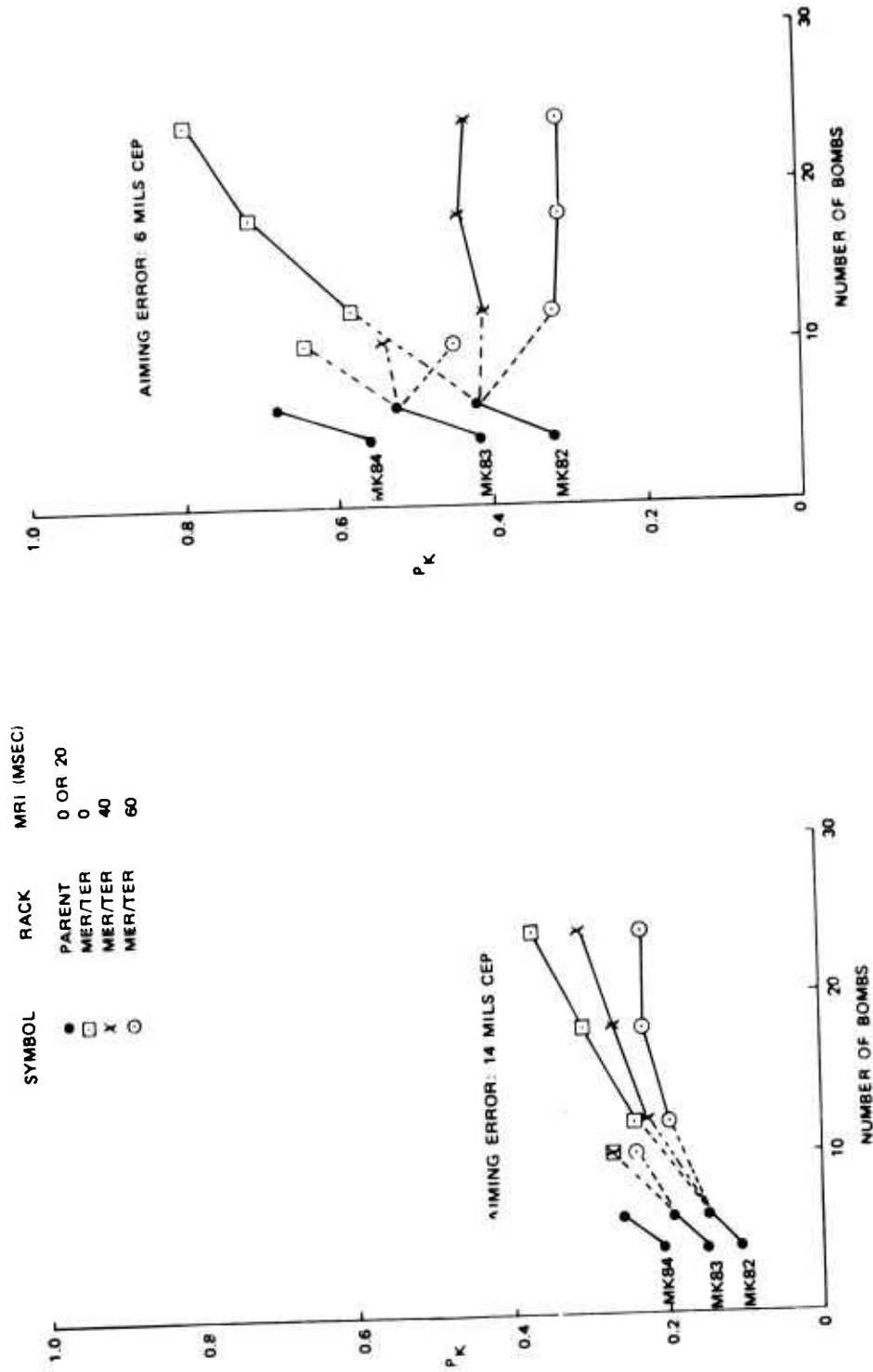
FIGURE 8. Relationship of $P_K$ With Aiming Error, MRI, Bomb Quantity, and Bomb Type. (LET × WET: $P_{HD} = 1$, attack parallel to LET or WET.) Mk 82 = 50 × 50 ft; Mk 83 = 60 × 60 ft; Mk 84 = 75 × 75 ft.

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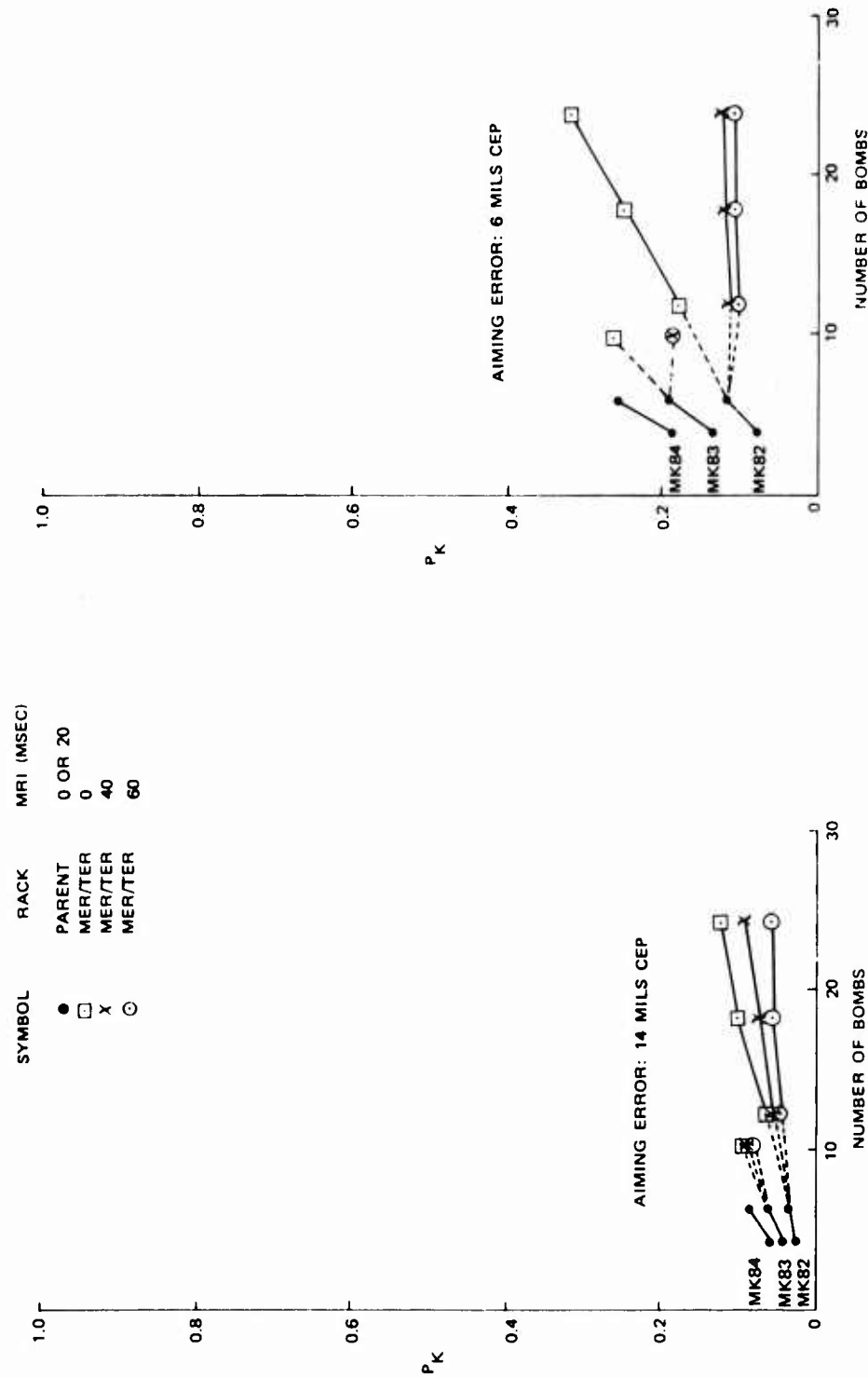
FIGURE 9. Relationship of $P_K$ With Aiming Error, Minimum Release Interval, Bomb Quantity, and Bomb Type. ($P_{HD}$: Mk 82 = 0.35; Mk 83 = 0.60; Mk 84 = 0.85. $L_{ET} \times W_{ET} = 80 \times 20$ ft; attack parallel to $L_{ET}$.)
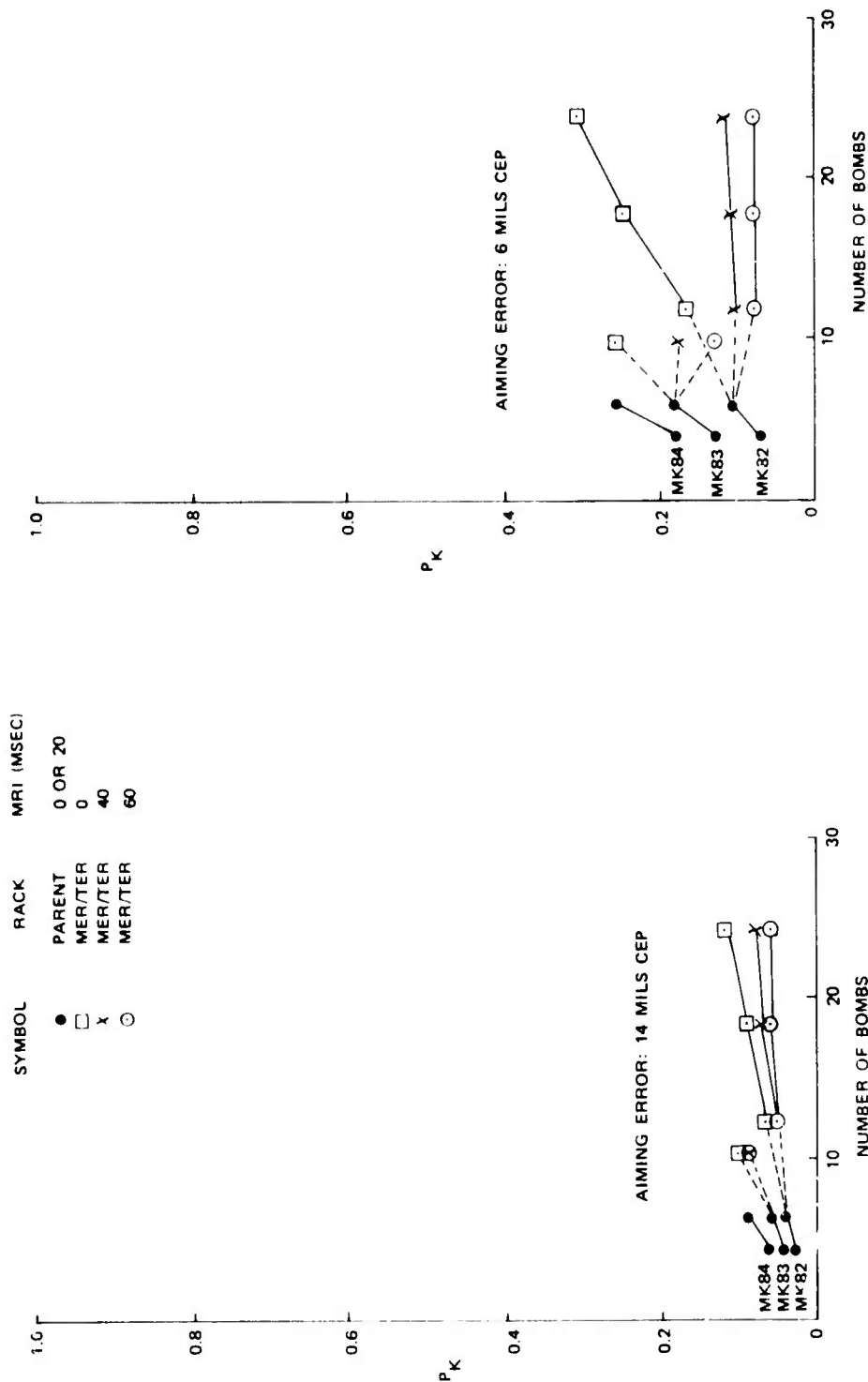
FIGURE 10. Relationship of $P_K$ With Aiming Error. MRI. Bomb Quantity, and Bomb Type. ($P_{HD}$: Mk 82 = 0.35; Mk 83 = 0.60; Mk 84 = 0.85. LET x WET = 80 x 20 ft: attack perpendicular to LET.)
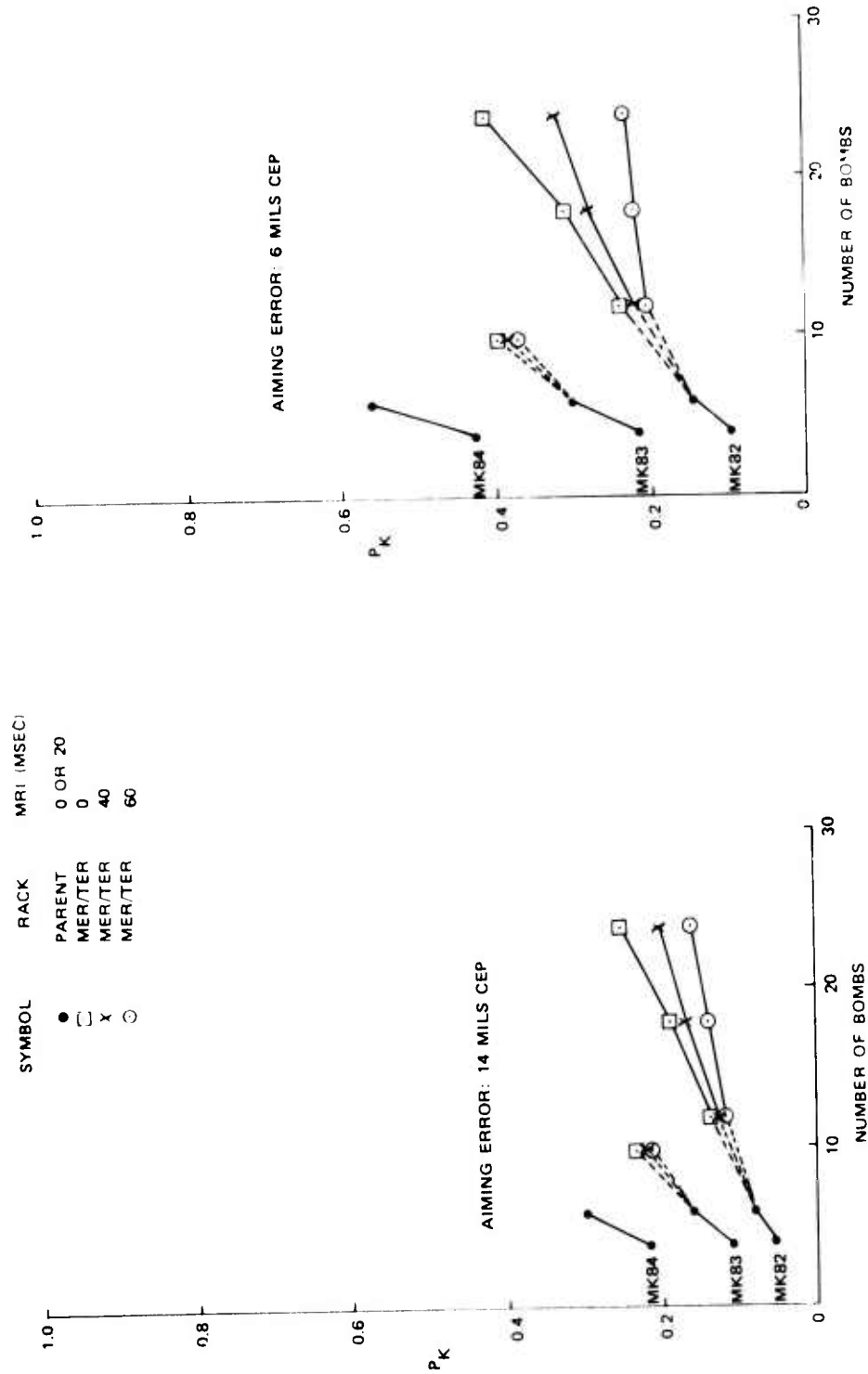
FIGURE 11. Relationship of $P_K$ With Aiming Error, MRI, Bomb Quantity, and Bomb Type. ($P_{HD}$: Mk 82 = 0.10; Mk 83 = 0.25; Mk 84 = 0.50. $P_{HD}$: Mk 82 = 0.10, Mk 83 = 0.25; Mk 84 = 0.50; LET x WET = 400 x 40 ft; attack parallel to LET.)
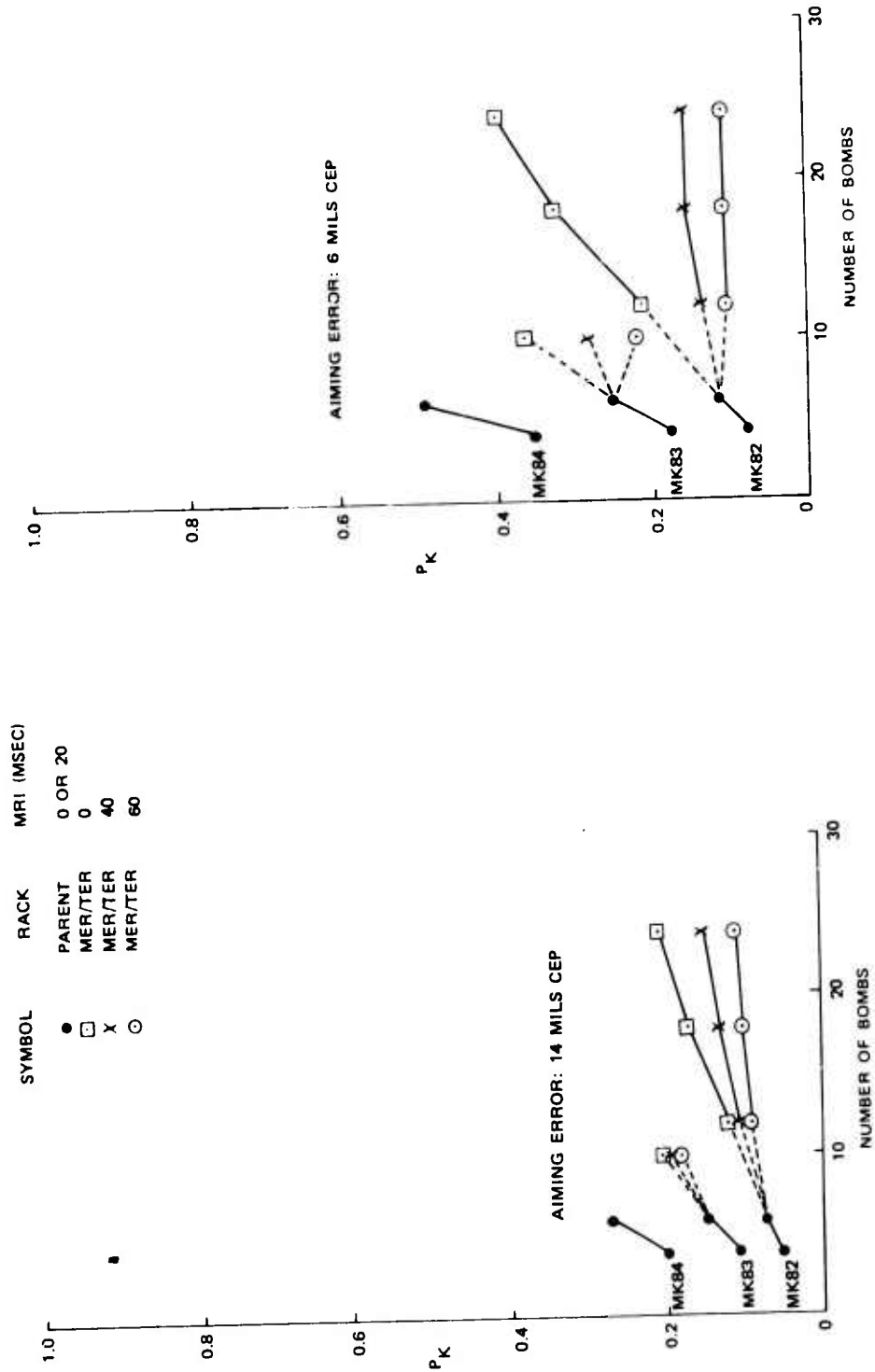
FIGURE 12. Relationship of $P_K$ With Aiming Error, MRI, Bomb Quantity, and Bomb Type. ($P_{HD}$: Mk 82 = 0.10; Mk 83 = 0.25; Mk 84 = 0.50. LET x WET = 400 x 40 ft; attack perpendicular to LET.)

## CONCLUSIONS

The following are the most significant conclusions of this study:

1. Realistic variations in bomb dispersion and loading configuration have no significant effect on $P_K$.

2. For single and pair sticks with the same MRI and the same number of bombs, the maximum available $P_K$ for the pair stick is better than or as good as the maximum available $P_K$ for the single stick.

3. A sizeable reduction of aiming error and/or sizeable increase in the quantity of bombs effect a substantial $P_K$ improvement only if accompanied by a sizeable reduction in MRI.

4. The 20-msec MRI for parent rack releases is smaller than necessary to achieve optimum spacing for maximum $P_K$ against most targets.

5. The reduction in MRI from 60 to 40 msec for MER/TER releases improves $P_K$, but is not nearly sufficient to allow optimum spacing for maximum $P_K$ against many targets.

6. As aiming error decreases, better $P_K$s can be achieved by dropping Mk 83s or 84s from parent racks at 20 msec than by dropping larger numbers of Mk 82s or 83s from MER/TERs at 40 msec.

Appendix

## LISTING OF $P_K$ VALUES

TABLE 4. Probability of Kill ($P_K$) for Sticks of Mk 82, 83, and 84
Low-Drag Bombs, Mean Area of Effectiveness = 500 sq ft.

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 4 MK 82,83,84 | 14 | 5 | singles | .02 | .02 | .02 | .02 | .02 | .02 |
| | | | pairs | .02 | .02 | .02 | .02 | .02 | .02 |
| | | 3 | singles | .03 | .03 | .03 | .02 | .02 | .02 |
| | | | pairs | .03 | .03 | .03 | .02 | .03 | .03 |
| | 10 | 5 | singles | .04 | .04 | .04 | .03 | .03 | .02 |
| | | | pairs | .04 | .04 | .04 | .04 | .04 | .03 |
| | | 3 | singles | .04 | .04 | .04 | .04 | .03 | .03 |
| | | | pairs | .04 | .04 | .04 | .04 | .04 | .04 |
| | 6 | 5 | singles | .08 | .07 | .06 | .05 | .04 | .03 |
| | | | pairs | .08 | .07 | .07 | .07 | .07 | .06 |
| | | 3 | singles | .10 | .10 | .08 | .07 | .05 | .04 |
| | | | pairs | .10 | .10 | .10 | .10 | .08 | .07 |
| 5 MK 82,83,84 | 14 | 5 | singles | .03 | .03 | .03 | .03 | .02 | .02 |
| | | | pairs | .03 | .03 | .03 | .03 | .03 | .02 |
| | | 3 | singles | .03 | .03 | .03 | .03 | .02 | .02 |
| | | | pairs | .03 | .03 | .03 | .03 | .03 | .03 |
| | 10 | 5 | singles | .05 | .05 | .04 | .03 | .03 | .02 |
| | | | pairs | .05 | .05 | .05 | .05 | .04 | .04 |
| | | 3 | singles | .05 | .05 | .05 | .04 | .03 | .03 |
| | | | pairs | .05 | .05 | .05 | .05 | .05 | .04 |
| | 6 | 5 | singles | .09 | .09 | .07 | .05 | .04 | .03 |
| | | | pairs | .09 | .09 | .09 | .08 | .07 | .06 |
| | | 3 | singles | .12 | .11 | .09 | .06 | .05 | .04 |
| | | | pairs | .12 | .12 | .11 | .09 | .08 | .07 |
| 6 MK 82,83,84 | 14 | 5 | singles | .03 | .03 | .03 | .02 | .02 | .02 |
| | | | pairs | .03 | .04 | .04 | .03 | .03 | .03 |
| | | 3 | singles | .03 | .04 | .03 | .03 | .03 | .02 |
| | | | pairs | .03 | .04 | .04 | .04 | .03 | .03 |
| | 10 | 5 | singles | .06 | .05 | .05 | .04 | .04 | .03 |
| | | | pairs | .06 | .06 | .06 | .05 | .05 | .05 |
| | | 3 | singles | .06 | .06 | .05 | .04 | .03 | .03 |
| | | | pairs | .06 | .06 | .06 | .06 | .05 | .05 |
| | 6 | 5 | singles | .11 | .11 | .08 | .05 | .04 | .03 |
| | | | pairs | .11 | .11 | .10 | .09 | .07 | .06 |
| | | 3 | singles | .14 | .12 | .08 | .06 | .05 | .04 |
| | | | pairs | .14 | .14 | .13 | .11 | .09 | .08 |
| 10 MK 83 | 14 | 5 | singles | .06 | .05 | .04 | .03 | .03 | .02 |
| | | | pairs | .06 | .06 | .05 | .04 | .04 | .03 |
| | | 3 | singles | .06 | .05 | .04 | .03 | .02 | .02 |
| | | | pairs | .06 | .06 | .06 | .05 | .04 | .04 |
| | 10 | 5 | singles | .08 | .07 | .05 | .04 | .03 | .02 |
| | | | pairs | .08 | .08 | .07 | .06 | .05 | .04 |
| | | 3 | singles | .10 | .08 | .05 | .04 | .03 | .02 |
| | | | pairs | .10 | .09 | .08 | .07 | .05 | .04 |
| | 6 | 5 | singles | .16 | .11 | .06 | .04 | .03 | .03 |
| | | | pairs | .16 | .14 | .11 | .08 | .07 | .05 |
| | | 3 | singles | .19 | .13 | .07 | .05 | .03 | .03 |
| | | | pairs | .19 | .17 | .13 | .09 | .07 | .05 |

## TABLE 4. (Contd.)

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 12 MK 82 | 14 | 5 | singles | .07 | .05 | .04 | .03 | .02 | .02 |
| | | | pairs | .07 | .06 | .05 | .04 | .04 | .03 |
| | | 3 | singles | .07 | .06 | .04 | .03 | .02 | .02 |
| | | | pairs | .07 | .07 | .06 | .05 | .04 | .03 |
| | 10 | 5 | singles | .10 | .07 | .05 | .03 | .02 | .02 |
| | | | pairs | .10 | .09 | .08 | .06 | .05 | .04 |
| | | 3 | singles | .12 | .09 | .05 | .03 | .03 | .02 |
| | | | pairs | .12 | .11 | .08 | .06 | .05 | .04 |
| | 6 | 5 | singles | .17 | .11 | .06 | .04 | .03 | .02 |
| | | | pairs | .17 | .15 | .10 | .08 | .06 | .04 |
| | | 3 | singles | .21 | .12 | .06 | .04 | .03 | .03 |
| | | | pairs | .21 | .17 | .12 | .08 | .06 | .04 |
| 18 MK 82 | 14 | 5 | singles | .09 | .07 | .04 | .03 | .02 | .02 |
| | | | pairs | .09 | .09 | .06 | .05 | .04 | .03 |
| | | 3 | singles | .09 | .07 | .04 | .03 | .02 | .01 |
| | | | pairs | .09 | .09 | .07 | .05 | .04 | .04 |
| | 10 | 5 | singles | .14 | .09 | .05 | .03 | .02 | .02 |
| | | | pairs | .14 | .12 | .10 | .06 | .05 | .04 |
| | | 3 | singles | .15 | .10 | .05 | .03 | .02 | .02 |
| | | | pairs | .15 | .13 | .10 | .07 | .05 | .03 |
| | 6 | 5 | singles | .25 | .11 | .05 | .04 | .03 | .02 |
| | | | pairs | .25 | .18 | .11 | .07 | .05 | .04 |
| | | 3 | singles | .29 | .11 | .06 | .04 | .03 | .02 |
| | | | pairs | .29 | .19 | .11 | .07 | .05 | .04 |
| 24 MK 82 | 14 | 5 | singles | .12 | .08 | .05 | | | |
| | | | pairs | .12 | .11 | .07 | .05 | | |
| | | 3 | singles | .11 | .08 | .04 | | | |
| | | | pairs | .11 | .11 | .08 | .06 | | |
| | 10 | 5 | singles | .18 | .09 | .05 | | | |
| | | | pairs | .18 | .14 | .09 | .06 | | |
| | | 3 | singles | .19 | .10 | .05 | | | |
| | | | pairs | .19 | .17 | .10 | .07 | | |
| | 6 | 5 | singles | .31 | .12 | .06 | | | |
| | | | pairs | .31 | .20 | .11 | .07 | | |
| | | 3 | singles | .35 | .11 | .06 | | | |
| | | | pairs | .35 | .21 | .11 | .07 | | |
| | 14 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 10 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 6 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | | | | | | | |

**TABLE 5.** Probability of Kill (P$_K$) for Sticks of Mk 82, 83, and 84 Low-Drag Bombs; Mean Area of Effectiveness = 2,000 sq ft.

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 4 MK 82,83,84 | 14 | 5 | singles | .08 | .09 | .08 | .08 | .07 | .07 |
| | | | pairs | .08 | .09 | .09 | .09 | .09 | .08 |
| | | 3 | singles | .09 | .09 | .09 | .09 | .08 | .07 |
| | | | pairs | .09 | .09 | .09 | .09 | .09 | .09 |
| | 10 | 5 | singles | .14 | .14 | .13 | .12 | .10 | .09 |
| | | | pairs | .14 | .14 | .13 | .13 | .13 | .13 |
| | | 3 | singles | .14 | .15 | .15 | .13 | .11 | .10 |
| | | | pairs | .14 | .14 | .15 | .15 | .15 | .14 |
| | 6 | 5 | singles | .26 | .25 | .22 | .19 | .15 | .12 |
| | | | pairs | .26 | .25 | .25 | .24 | .23 | .21 |
| | | 3 | singles | .30 | .30 | .27 | .22 | .18 | .14 |
| | | | pairs | .30 | .30 | .31 | .30 | .28 | .25 |
| 5 MK 82,83,84 | 14 | 5 | singles | .10 | .10 | .10 | .09 | .08 | .07 |
| | | | pairs | .10 | .10 | .10 | .10 | .09 | .09 |
| | | 3 | singles | .10 | .11 | .11 | .10 | .09 | .08 |
| | | | pairs | .10 | .10 | .11 | .11 | .11 | .10 |
| | 10 | 5 | singles | .17 | .17 | .16 | .13 | .11 | .10 |
| | | | pairs | .17 | .17 | .17 | .16 | .16 | .15 |
| | | 3 | singles | .17 | .17 | .17 | .15 | .12 | .10 |
| | | | pairs | .17 | .17 | .18 | .17 | .17 | .15 |
| | 6 | 5 | singles | .31 | .29 | .24 | .19 | .15 | .12 |
| | | | pairs | .31 | .30 | .29 | .26 | .23 | .21 |
| | | 3 | singles | .35 | .34 | .29 | .22 | .17 | .14 |
| | | | pairs | .35 | .35 | .34 | .31 | .28 | .24 |
| 6 MK 82,83,84 | 14 | 5 | singles | .12 | .12 | .10 | .09 | .08 | .07 |
| | | | pairs | .12 | .12 | .12 | .12 | .11 | .10 |
| | | 3 | singles | .11 | .12 | .12 | .11 | .09 | .08 |
| | | | pairs | .11 | .12 | .12 | .13 | .12 | .11 |
| | 10 | 5 | singles | .20 | .19 | .17 | .14 | .12 | .09 |
| | | | pairs | .20 | .19 | .19 | .18 | .18 | .17 |
| | | 3 | singles | .19 | .20 | .18 | .15 | .12 | .10 |
| | | | pairs | .19 | .20 | .20 | .20 | .19 | .17 |
| | 6 | 5 | singles | .35 | .33 | .27 | .20 | .15 | .12 |
| | | | pairs | .35 | .35 | .33 | .30 | .26 | .23 |
| | | 3 | singles | .39 | .38 | .30 | .22 | .17 | .14 |
| | | | pairs | .39 | .40 | .39 | .35 | .30 | .26 |
| 10 MK 83 | 14 | 5 | singles | .18 | .18 | .14 | .10 | .09 | .07 |
| | | | pairs | .18 | .18 | .17 | .15 | .14 | .12 |
| | | 3 | singles | .17 | .18 | .15 | .11 | .08 | .07 |
| | | | pairs | .17 | .18 | .18 | .16 | .15 | .13 |
| | 10 | 5 | singles | .28 | .25 | .18 | .13 | .10 | .08 |
| | | | pairs | .28 | .27 | .25 | .22 | .18 | .15 |
| | | 3 | singles | .28 | .28 | .19 | .15 | .11 | .09 |
| | | | pairs | .28 | .30 | .27 | .23 | .20 | .16 |
| | 6 | 5 | singles | .47 | .35 | .22 | .16 | .12 | .10 |
| | | | pairs | .47 | .42 | .35 | .28 | .23 | .19 |
| | | 3 | singles | .51 | .40 | .24 | .17 | .13 | .11 |
| | | | pairs | .51 | .50 | .41 | .31 | .24 | .19 |

## TABLE 5.  (Contd.)

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 12 MK 82 | 14 | 5 | singles | .20 | .18 | .15 | .11 | .08 | .07 |
| | | | pairs | .20 | .21 | .18 | .17 | .14 | .12 |
| | | 3 | singles | .19 | .19 | .14 | .11 | .08 | .07 |
| | | | pairs | .19 | .21 | .19 | .16 | .14 | .12 |
| | 10 | 5 | singles | .32 | .26 | .18 | .13 | .09 | .08 |
| | | | pairs | .32 | .31 | .26 | .22 | .18 | .15 |
| | | 3 | singles | .32 | .28 | .18 | .13 | .10 | .08 |
| | | | pairs | .32 | .32 | .27 | .22 | .18 | .15 |
| | 6 | 5 | singles | .49 | .35 | .20 | .14 | .11 | .10 |
| | | | pairs | .49 | .46 | .35 | .26 | .21 | .17 |
| | | 3 | singles | .54 | .39 | .22 | .15 | .12 | .10 |
| | | | pairs | .54 | .51 | .38 | .29 | .22 | .17 |
| 18 MK 82 | 14 | 5 | singles | .26 | .23 | .15 | .11 | .08 | .07 |
| | | | pairs | .26 | .26 | .23 | .19 | .15 | .13 |
| | | 3 | singles | .23 | .25 | .16 | .11 | .08 | .07 |
| | | | pairs | .23 | .28 | .25 | .20 | .16 | .13 |
| | 10 | 5 | singles | .40 | .31 | .17 | .12 | .09 | .07 |
| | | | pairs | .40 | .38 | .31 | .22 | .18 | .15 |
| | | 3 | singles | .37 | .32 | .19 | .12 | .09 | .08 |
| | | | pairs | .37 | .40 | .32 | .24 | .19 | .14 |
| | 6 | 5 | singles | .63 | .37 | .19 | .13 | .10 | .09 |
| | | | pairs | .63 | .54 | .37 | .26 | .19 | .16 |
| | | 3 | singles | .64 | .39 | .22 | .15 | .11 | .09 |
| | | | pairs | .64 | .58 | .39 | .28 | .21 | .17 |
| 24 MK 82 | 14 | 5 | singles | .31 | .25 | .16 | | | |
| | | | pairs | .31 | .33 | .25 | .19 | | |
| | | 3 | singles | .26 | .25 | .15 | | | |
| | | | pairs | .26 | .31 | .25 | .19 | | |
| | 10 | 5 | singles | .47 | .31 | .18 | | | |
| | | | pairs | .47 | .44 | .31 | .22 | | |
| | | 3 | singles | .42 | .31 | .18 | | | |
| | | | pairs | .42 | .46 | .32 | .24 | | |
| | 6 | 5 | singles | .72 | .37 | .20 | | | |
| | | | pairs | .72 | .57 | .37 | .26 | | |
| | | 3 | singles | .70 | .37 | .21 | | | |
| | | | pairs | .70 | .59 | .37 | .26 | | |
| | 14 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 10 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 6 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | | | | | | | |

TABLE 6. Probability of Kill ($P_K$) for Sticks of Mk 82, 83, and 84 Low-Drag Bombs; Mean Area of Effectiveness = 10,000 sq ft.

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 4 MK 82,83,84 | 14 | 5 | singles | .30 | .30 | .31 | .30 | .29 | .27 |
| | | | pairs | .30 | .30 | .30 | .31 | .31 | .31 |
| | | 3 | singles | .28 | .30 | .32 | .33 | .31 | .29 |
| | | | pairs | .28 | .29 | .30 | .31 | .32 | .32 |
| | 10 | 5 | singles | .44 | .44 | .44 | .43 | .39 | .35 |
| | | | pairs | .44 | .44 | .44 | .44 | .44 | .44 |
| | | 3 | singles | .44 | .45 | .48 | .47 | .43 | .39 |
| | | | pairs | .44 | .44 | .45 | .47 | .48 | .48 |
| | 6 | 5 | singles | .68 | .67 | .64 | .58 | .51 | .44 |
| | | | pairs | .68 | .68 | .67 | .66 | .65 | .62 |
| | | 3 | singles | .70 | .72 | .71 | .65 | .57 | .49 |
| | | | pairs | .70 | .71 | .72 | .72 | .72 | .69 |
| 5 MK 82,83,84 | 14 | 5 | singles | .34 | .35 | .35 | .35 | .32 | .29 |
| | | | pairs | .34 | .34 | .35 | .35 | .35 | .35 |
| | | 3 | singles | .31 | .34 | .37 | .37 | .35 | .31 |
| | | | pairs | .31 | .32 | .34 | .36 | .37 | .37 |
| | 10 | 5 | singles | .50 | .50 | .50 | .47 | .42 | .36 |
| | | | pairs | .50 | .50 | .50 | .50 | .50 | .48 |
| | | 3 | singles | .48 | .51 | .54 | .51 | .45 | .39 |
| | | | pairs | .48 | .49 | .51 | .53 | .53 | .51 |
| | 6 | 5 | singles | .74 | .73 | .68 | .60 | .51 | .43 |
| | | | pairs | .74 | .74 | .73 | .71 | .67 | .62 |
| | | 3 | singles | .75 | .77 | .75 | .66 | .57 | .49 |
| | | | pairs | .75 | .76 | .77 | .77 | .74 | .69 |
| 6 MK 82,83,84 | 14 | 5 | singles | .37 | .39 | .39 | .37 | .33 | .30 |
| | | | pairs | .37 | .39 | .39 | .39 | .39 | .39 |
| | | 3 | singles | .33 | .37 | .41 | .40 | .36 | .32 |
| | | | pairs | .33 | .34 | .37 | .40 | .41 | .41 |
| | 10 | 5 | singles | .54 | .55 | .55 | .50 | .44 | .37 |
| | | | pairs | .54 | .54 | .55 | .56 | .55 | .54 |
| | | 3 | singles | .51 | .56 | .58 | .53 | .46 | .40 |
| | | | pairs | .51 | .52 | .56 | .58 | .58 | .56 |
| | 6 | 5 | singles | .79 | .78 | .72 | .61 | .51 | .44 |
| | | | pairs | .79 | .79 | .78 | .76 | .72 | .67 |
| | | 3 | singles | .79 | .82 | .78 | .67 | .56 | .49 |
| | | | pairs | .79 | .80 | .82 | .82 | .78 | .72 |
| 10 MK 83 | 14 | 5 | singles | .47 | .52 | .49 | .40 | .34 | .28 |
| | | | pairs | .47 | .49 | .52 | .51 | .49 | .45 |
| | | 3 | singles | .41 | .51 | .50 | .42 | .35 | .30 |
| | | | pairs | .41 | .47 | .51 | .52 | .50 | .47 |
| | 10 | 5 | singles | .67 | .70 | .60 | .48 | .39 | .33 |
| | | | pairs | .67 | .69 | .70 | .66 | .60 | .54 |
| | | 3 | singles | .60 | .71 | .63 | .51 | .42 | .36 |
| | | | pairs | .60 | .67 | .71 | .69 | .63 | .56 |
| | 6 | 5 | singles | .89 | .85 | .68 | .54 | .44 | .37 |
| | | | pairs | .89 | .89 | .85 | .77 | .69 | .61 |
| | | 3 | singles | .87 | .89 | .72 | .58 | .48 | .42 |
| | | | pairs | .87 | .91 | .89 | .82 | .72 | .64 |

TABLE 6. (Contd.)

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 12 MK 82 | 14 | 5 | singles | .51 | .56 | .50 | .40 | .33 | .28 |
| | | | pairs | .51 | .54 | .56 | .54 | .49 | .44 |
| | | 3 | singles | .45 | .56 | .50 | .41 | .34 | .29 |
| | | | pairs | .45 | .52 | .56 | .54 | .50 | .45 |
| | 10 | 5 | singles | .70 | .73 | .59 | .46 | .38 | .32 |
| | | | pairs | .70 | .73 | .73 | .66 | .59 | .51 |
| | | 3 | singles | .64 | .74 | .61 | .49 | .41 | .35 |
| | | | pairs | .64 | .72 | .74 | .68 | .61 | .54 |
| | 6 | 5 | singles | .90 | .85 | .66 | .53 | .44 | .38 |
| | | | pairs | .90 | .91 | .86 | .76 | .66 | .59 |
| | | 3 | singles | .87 | .89 | .70 | .56 | .48 | .41 |
| | | | pairs | .87 | .93 | .89 | .79 | .69 | .61 |
| 18 MK 82 | 14 | 5 | singles | .57 | .67 | .54 | .42 | .34 | .28 |
| | | | pairs | .57 | .65 | .67 | .61 | .54 | .47 |
| | | 3 | singles | .49 | .68 | .56 | .44 | .36 | .30 |
| | | | pairs | .49 | .62 | .67 | .62 | .55 | .49 |
| | 10 | 5 | singles | .76 | .80 | .61 | .47 | .38 | .32 |
| | | | pairs | .76 | .82 | .80 | .70 | .61 | .53 |
| | | 3 | singles | .68 | .82 | .64 | .49 | .40 | .34 |
| | | | pairs | .68 | .82 | .82 | .72 | .63 | .55 |
| | 6 | 5 | singles | .95 | .88 | .66 | .51 | .41 | .35 |
| | | | pairs | .95 | .96 | .88 | .76 | .66 | .57 |
| | | 3 | singles | .92 | .91 | .71 | .56 | .46 | .38 |
| | | | pairs | .92 | .97 | .91 | .80 | .70 | .61 |
| 24 MK 82 | 14 | 5 | singles | .61 | .69 | .52 | | | |
| | | | pairs | .61 | .72 | .69 | .60 | | |
| | | 3 | singles | .53 | .67 | .51 | | | |
| | | | pairs | .53 | .68 | .67 | .59 | | |
| | 10 | 5 | singles | .79 | .80 | .59 | | | |
| | | | pairs | .79 | .87 | .80 | .68 | | |
| | | 3 | singles | .72 | .80 | .61 | | | |
| | | | pairs | .72 | .87 | .80 | .69 | | |
| | 6 | 5 | singles | .97 | .87 | .65 | | | |
| | | | pairs | .97 | .97 | .87 | .75 | | |
| | | 3 | singles | .93 | .88 | .69 | | | |
| | | | pairs | .93 | .98 | .88 | .78 | | |
| | 14 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 10 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 6 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | | | | | | | |

TABLE 7. Probability of Kill ($P_K$) for Sticks of Mk 82, 83, and 84 Low-Drag Bombs; Mean Area of Effectiveness = 20,000 sq ft.

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 4 MK 82,83,84 | 14 | 5 | singles | .45 | .46 | .48 | .48 | .47 | .45 |
| | | | pairs | .45 | .46 | .46 | .47 | .48 | .48 |
| | | 3 | singles | .43 | .45 | .48 | .50 | .50 | .48 |
| | | | pairs | .43 | .43 | .44 | .46 | .48 | .49 |
| | 10 | 5 | singles | .62 | .63 | .64 | .63 | .60 | .55 |
| | | | pairs | .62 | .62 | .62 | .63 | .64 | .64 |
| | | 3 | singles | .61 | .63 | .66 | .67 | .64 | .60 |
| | | | pairs | .61 | .62 | .63 | .64 | .66 | .67 |
| | 6 | 5 | singles | .84 | .84 | .82 | .78 | .71 | .64 |
| | | | pairs | .84 | .84 | .84 | .83 | .83 | .81 |
| | | 3 | singles | .85 | .86 | .87 | .83 | .77 | .70 |
| | | | pairs | .85 | .85 | .86 | .87 | .87 | .86 |
| 5 MK 82,83,84 | 14 | 5 | singles | .50 | .51 | .53 | .53 | .51 | .47 |
| | | | pairs | .50 | .51 | .52 | .53 | .53 | .53 |
| | | 3 | singles | .46 | .49 | .54 | .56 | .54 | .51 |
| | | | pairs | .46 | .47 | .50 | .52 | .54 | .55 |
| | 10 | 5 | singles | .67 | .68 | .70 | .68 | .63 | .57 |
| | | | pairs | .67 | .68 | .68 | .69 | .69 | .69 |
| | | 3 | singles | .66 | .69 | .73 | .72 | .67 | .61 |
| | | | pairs | .66 | .66 | .69 | .71 | .72 | .72 |
| | 6 | 5 | singles | .88 | .88 | .86 | .80 | .72 | .64 |
| | | | pairs | .88 | .88 | .88 | .87 | .85 | .82 |
| | | 3 | singles | .88 | .90 | .90 | .85 | .77 | .70 |
| | | | pairs | .88 | .89 | .90 | .90 | .89 | .86 |
| 6 MK 82,83,84 | 14 | 5 | singles | .54 | .56 | .58 | .57 | .54 | .49 |
| | | | pairs | .54 | .54 | .56 | .57 | .58 | .58 |
| | | 3 | singles | .49 | .53 | .59 | .60 | .57 | .52 |
| | | | pairs | .49 | .50 | .53 | .57 | .59 | .60 |
| | 10 | 5 | singles | .71 | .73 | .75 | .71 | .65 | .58 |
| | | | pairs | .71 | .72 | .73 | .74 | .75 | .74 |
| | | 3 | singles | .69 | .73 | .77 | .75 | .68 | .61 |
| | | | pairs | .69 | .70 | .73 | .76 | .77 | .77 |
| | 6 | 5 | singles | .91 | .91 | .89 | .81 | .72 | .64 |
| | | | pairs | .91 | .91 | .91 | .91 | .89 | .86 |
| | | 3 | singles | .91 | .93 | .92 | .85 | .77 | .69 |
| | | | pairs | .91 | .91 | .93 | .94 | .92 | .89 |
| 10 MK 83 | 14 | 5 | singles | .62 | .69 | .70 | .62 | .54 | .47 |
| | | | pairs | .62 | .65 | .69 | .71 | .70 | .67 |
| | | 3 | singles | .57 | .69 | .71 | .64 | .56 | .49 |
| | | | pairs | .57 | .62 | .69 | .72 | .71 | .68 |
| | 10 | 5 | singles | .81 | .86 | .81 | .70 | .61 | .53 |
| | | | pairs | .81 | .84 | .86 | .85 | .82 | .76 |
| | | 3 | singles | .76 | .86 | .84 | .74 | .65 | .57 |
| | | | pairs | .76 | .81 | .86 | .87 | .84 | .79 |
| | 6 | 5 | singles | .97 | .96 | .88 | .76 | .66 | .58 |
| | | | pairs | .97 | .97 | .97 | .93 | .88 | .82 |
| | | 3 | singles | .95 | .98 | .91 | .80 | .71 | .63 |
| | | | pairs | .95 | .97 | .98 | .95 | .91 | .85 |

## TABLE 7. (Contd.)

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 12 MK 82 | 14 | 5 | singles | .66 | .74 | .71 | .61 | .53 | .46 |
| | | | pairs | .66 | .70 | .74 | .74 | .71 | .66 |
| | | 3 | singles | .60 | .73 | .72 | .63 | .55 | .49 |
| | | | pairs | .60 | .67 | .73 | .75 | .72 | .68 |
| | 10 | 5 | singles | .83 | .89 | .80 | .68 | .59 | .52 |
| | | | pairs | .83 | .86 | .89 | .86 | .80 | .74 |
| | | 3 | singles | .78 | .89 | .83 | .72 | .63 | .56 |
| | | | pairs | .78 | .85 | .89 | .88 | .83 | .77 |
| | 6 | 5 | singles | .97 | .97 | .87 | .75 | .66 | .59 |
| | | | pairs | .97 | .98 | .97 | .93 | .87 | .81 |
| | | 3 | singles | .95 | .98 | .89 | .79 | .70 | .63 |
| | | | pairs | .95 | .98 | .98 | .95 | .89 | .84 |
| 18 MK 82 | 14 | 5 | singles | .71 | .84 | .76 | .64 | .55 | .48 |
| | | | pairs | .71 | .79 | .84 | .82 | .76 | .69 |
| | | 3 | singles | .65 | .84 | .78 | .67 | .58 | .50 |
| | | | pairs | .65 | .77 | .84 | .83 | .77 | .72 |
| | 10 | 5 | singles | .87 | .94 | .83 | .70 | .60 | .52 |
| | | | pairs | .87 | .93 | .94 | .89 | .83 | .76 |
| | | 3 | singles | .82 | .95 | .86 | .74 | .63 | .55 |
| | | | pairs | .82 | .92 | .95 | .91 | .85 | .79 |
| | 6 | 5 | singles | .99 | .98 | .87 | .74 | .64 | .55 |
| | | | pairs | .99 | .99 | .98 | .93 | .87 | .80 |
| | | 3 | singles | .97 | .99 | .91 | .79 | .69 | .61 |
| | | | pairs | .97 | 1.00 | .99 | .95 | .90 | .84 |
| 24 MK 82 | 14 | 5 | singles | .74 | .86 | .74 | | | |
| | | | pairs | .74 | .85 | .86 | .81 | | |
| | | 3 | singles | .68 | .85 | .74 | | | |
| | | | pairs | .68 | .83 | .85 | .80 | | |
| | 10 | 5 | singles | .89 | .94 | .81 | | | |
| | | | pairs | .89 | .96 | .94 | .88 | | |
| | | 3 | singles | .85 | .94 | .83 | | | |
| | | | pairs | .85 | .95 | .94 | .89 | | |
| | 6 | 5 | singles | .99 | .98 | .86 | | | |
| | | | pairs | .99 | 1.00 | .98 | .92 | | |
| | | 3 | singles | .98 | .98 | .89 | | | |
| | | | pairs | .98 | 1.00 | .98 | .94 | | |
| | 14 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 10 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 6 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |

TABLE 8. Probability of Kill ($P_K$) for Sticks of Mk 82, 83, and 84
Low-Drag Bombs; Mean Area of Effectiveness = 100,000 sq ft.

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 4 MK 82,83,84 | 14 | 5 | singles | .84 | .84 | .85 | .87 | .87 | .87 |
| | | | pairs | .84 | .84 | .84 | .85 | .85 | .86 |
| | | 3 | singles | .83 | .83 | .85 | .87 | .88 | .88 |
| | | | pairs | .83 | .83 | .83 | .84 | .85 | .86 |
| | 10 | 5 | singles | .93 | .93 | .94 | .94 | .94 | .93 |
| | | | pairs | .93 | .93 | .93 | .94 | .94 | .94 |
| | | 3 | singles | .93 | .94 | .94 | .95 | .96 | .95 |
| | | | pairs | .93 | .93 | .94 | .94 | .94 | .95 |
| | 6 | 5 | singles | .99 | .99 | .99 | .99 | .98 | .96 |
| | | | pairs | .99 | .99 | .99 | .99 | .99 | .99 |
| | | 3 | singles | .99 | .99 | .99 | .99 | .99 | .97 |
| | | | pairs | .99 | .99 | .99 | .99 | .99 | .99 |
| 5 MK 82,83,84 | 14 | 5 | singles | .87 | .87 | .89 | .91 | .91 | .90 |
| | | | pairs | .87 | .87 | .88 | .88 | .89 | .90 |
| | | 3 | singles | .86 | .87 | .89 | .91 | .92 | .92 |
| | | | pairs | .86 | .86 | .87 | .88 | .89 | .90 |
| | 10 | 5 | singles | .95 | .95 | .96 | .97 | .96 | .95 |
| | | | pairs | .95 | .95 | .96 | .96 | .96 | .96 |
| | | 3 | singles | .95 | .96 | .96 | .97 | .97 | .96 |
| | | | pairs | .95 | .95 | .96 | .96 | .97 | .97 |
| | 6 | 5 | singles | .99 | .99 | .99 | .99 | .98 | .97 |
| | | | pairs | .99 | .99 | .99 | .99 | .99 | .99 |
| | | 3 | singles | 1.00 | 1.00 | 1.00 | 1.00 | .99 | .97 |
| | | | pairs | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 6 MK 82,83 84 | 14 | 5 | singles | .89 | .90 | .92 | .93 | .93 | .92 |
| | | | pairs | .89 | .89 | .90 | .91 | .92 | .93 |
| | | 3 | singles | .88 | .89 | .92 | .94 | .94 | .93 |
| | | | pairs | .88 | .88 | .89 | .90 | .91 | .92 |
| | 10 | 5 | singles | .96 | .97 | .98 | .98 | .97 | .95 |
| | | | pairs | .96 | .96 | .97 | .97 | .98 | ..98 |
| | | 3 | singles | .96 | .97 | .98 | .98 | .98 | .96 |
| | | | pairs | .96 | .96 | .97 | .97 | .98 | .98 |
| | 6 | 5 | singles | 1.00 | 1.00 | 1.00 | .99 | .99 | .97 |
| | | | pairs | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| | | 3 | singles | 1.00 | 1.00 | 1.00 | 1.00 | .99 | .98 |
| | | | pairs | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10 MK 83 | 14 | 5 | singles | .93 | .95 | .98 | .98 | .96 | .92 |
| | | | pairs | .93 | .94 | .95 | .97 | .98 | .98 |
| | | 3 | singles | .93 | .96 | .98 | .98 | .96 | .93 |
| | | | pairs | .93 | .94 | .96 | .97 | .98 | .98 |
| | 10 | 5 | singles | .98 | .99 | 1.00 | .99 | .97 | .94 |
| | | | pairs | .98 | .99 | .99 | .99 | 1.00 | .99 |
| | | 3 | singles | .98 | .99 | 1.00 | .99 | .98 | .95 |
| | | | pairs | .98 | .99 | .99 | 1.00 | 1.00 | 1.00 |
| | 6 | 5 | singles | 1.00 | 1.00 | 1.00 | .99 | .98 | .95 |
| | | | pairs | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| | | 3 | singles | 1.00 | 1.00 | 1.00 | 1.00 | .98 | .97 |
| | | | pairs | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |

## TABLE 8. (Contd.)

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 12 MK 82 | 14 | 5 | singles | .94 | .97 | .99 | .98 | .95 | .92 |
| | | | pairs | .94 | .95 | .97 | .98 | .99 | .98 |
| | | 3 | singles | .93 | .97 | .99 | .98 | .96 | .93 |
| | | | pairs | .93 | .95 | .97 | .98 | .99 | .99 |
| | 10 | 5 | singles | .99 | 1.00 | 1.00 | .99 | .97 | .94 |
| | | | pairs | .99 | .99 | 1.00 | 1.00 | 1.00 | .99 |
| | | 3 | singles | .99 | 1.00 | 1.00 | .99 | .98 | .95 |
| | | | pairs | .99 | .99 | 1.00 | 1.00 | 1.00 | 1.00 |
| | 6 | 5 | singles | 1.00 | 1.00 | 1.00 | .99 | .98 | .96 |
| | | | pairs | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| | | 3 | singles | 1.00 | 1.00 | 1.00 | 1.00 | .99 | .97 |
| | | | pairs | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 18 MK 82 | 14 | 5 | singles | .96 | .99 | .99 | .98 | .96 | .93 |
| | | | pairs | .96 | .97 | .99 | 1.00 | .99 | .99 |
| | | 3 | singles | .95 | .99 | 1.00 | .99 | .96 | .94 |
| | | | pairs | .95 | .97 | .99 | 1.00 | 1.0C | .99 |
| | 10 | 5 | singles | .99 | 1.00 | 1.00 | .99 | .97 | .94 |
| | | | pairs | .99 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| | | 3 | singles | .99 | 1.00 | 1.00 | .99 | .98 | .95 |
| | | | pairs | .99 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| | 6 | 5 | singles | 1.00 | 1.00 | 1.00 | .99 | .98 | .95 |
| | | | pairs | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| | | 3 | singles | 1.00 | 1.00 | 1.00 | 1.00 | .99 | .97 |
| | | | pairs | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 24 MK 82 | 14 | 5 | singles | .97 | 1.00 | .99 | | | |
| | | | pairs | .97 | .98 | 1.00 | 1.00 | | |
| | | 3 | singles | .96 | 1.00 | .99 | | | |
| | | | pairs | .96 | .98 | 1.00 | 1.00 | | |
| | 10 | 5 | singles | 1.00 | 1.00 | 1.00 | | | |
| | | | pairs | 1.00 | 1.00 | 1.00 | 1.00 | | |
| | | 3 | singles | .99 | 1.00 | 1.00 | | | |
| | | | pairs | .99 | 1.00 | 1.00 | 1.00 | | |
| | 6 | 5 | singles | 1.00 | 1.00 | 1.00 | | | |
| | | | pairs | 1.00 | 1.00 | 1.00 | 1.00 | | |
| | | 3 | singles | 1.00 | 1.00 | 1.00 | | | |
| | | | pairs | 1.00 | 1.00 | 1.00 | 1.00 | | |
| | 14 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 10 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 6 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | | | | | | | |

**TABLE 9. Probability of Kill (P$_K$) for Sticks of Mk 82, 83, and 84 Low-Drag Bombs; Effective Target Dimensions = 30 x 30 ft; Probability of Damage, Given a Hit = 1.0; Attack Direction, Parallel to Length.**

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 4 MK 82,83,84 | 14 | 5 | singles | .04 | .04 | .04 | .04 | .03 | .03 |
| | | | pairs | .04 | .04 | .04 | .04 | .04 | .04 |
| | | 3 | singles | .04 | .05 | .04 | .04 | .04 | .04 |
| | | | pairs | .04 | .04 | .04 | .05 | .04 | .05 |
| | 10 | 5 | singles | .07 | .07 | .06 | .05 | .05 | .04 |
| | | | pairs | .07 | .07 | .07 | .07 | .06 | .06 |
| | | 3 | singles | .07 | .07 | .07 | .07 | .05 | .05 |
| | | | pairs | .07 | .07 | .07 | .07 | .07 | .07 |
| | 6 | 5 | singles | .13 | .12 | .11 | .09 | .08 | .07 |
| | | | pairs | .13 | .13 | .12 | .13 | .12 | .11 |
| | | 3 | singles | .17 | .17 | .15 | .12 | .09 | .07 |
| | | | pairs | .17 | .18 | .17 | .16 | .15 | .12 |
| 5 MK 82,83,84 | 14 | 5 | singles | .05 | .05 | .05 | .04 | .04 | .04 |
| | | | pairs | .05 | .05 | .05 | .05 | .05 | .04 |
| | | 3 | singles | .05 | .05 | .05 | .05 | .04 | .03 |
| | | | pairs | .05 | .05 | .05 | .05 | .05 | .05 |
| | 10 | 5 | singles | .09 | .08 | .08 | .06 | .05 | .04 |
| | | | pairs | .09 | .08 | .08 | .08 | .07 | .07 |
| | | 3 | singles | .09 | .09 | .09 | .07 | .06 | .05 |
| | | | pairs | .09 | .09 | .09 | .09 | .09 | .08 |
| | 6 | 5 | singles | .16 | .16 | .12 | .10 | .07 | .06 |
| | | | pairs | .16 | .16 | .16 | .13 | .12 | .11 |
| | | 3 | singles | .20 | .19 | .15 | .12 | .09 | .07 |
| | | | pairs | .20 | .20 | .19 | .16 | .15 | .12 |
| 6 MK 82,83,84 | 14 | 5 | singles | .06 | .06 | .04 | .04 | .04 | .03 |
| | | | pairs | .06 | .06 | .06 | .05 | .05 | .05 |
| | | 3 | singles | .06 | .06 | .06 | .05 | .05 | .04 |
| | | | pairs | .06 | .06 | .06 | .06 | .06 | .05 |
| | 10 | 5 | singles | .10 | .09 | .09 | .07 | .06 | .04 |
| | | | pairs | .10 | .10 | .10 | .09 | .09 | .08 |
| | | 3 | singles | .10 | .11 | .09 | .07 | .06 | .05 |
| | | | pairs | .10 | .10 | .11 | .10 | .10 | .09 |
| | 6 | 5 | singles | .19 | .18 | .14 | .10 | .08 | .06 |
| | | | pairs | .19 | .19 | .18 | .16 | .13 | .12 |
| | | 3 | singles | .22 | .20 | .15 | .11 | .09 | .08 |
| | | | pairs | .22 | .23 | .22 | .19 | .16 | .14 |
| 10 MK 83 | 14 | 5 | singles | .10 | .09 | .07 | .05 | .04 | .03 |
| | | | pairs | .10 | .09 | .08 | .07 | .06 | .06 |
| | | 3 | singles | .11 | .09 | .07 | .05 | .04 | .03 |
| | | | pairs | .11 | .10 | .09 | .08 | .07 | .07 |
| | 10 | 5 | singles | .14 | .12 | .09 | .06 | .05 | .04 |
| | | | pairs | .14 | .14 | .12 | .11 | .08 | .07 |
| | | 3 | singles | .16 | .14 | .09 | .07 | .06 | .04 |
| | | | pairs | .16 | .16 | .14 | .12 | .10 | .07 |
| | 6 | 5 | singles | .27 | .19 | .12 | .08 | .06 | .05 |
| | | | pairs | .27 | .24 | .18 | .14 | .12 | .09 |
| | | 3 | singles | .32 | .22 | .11 | .08 | .06 | .05 |
| | | | pairs | .32 | .29 | .22 | .16 | .12 | .09 |

## TABLE 9. (Contd.)

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 12 Mk 82 | 14 | 5 | singles | .10 | .09 | .07 | .05 | .04 | .03 |
| | | | pairs | .10 | .10 | .08 | .08 | .07 | .06 |
| | | 3 | singles | .11 | .10 | .07 | .05 | .03 | .03 |
| | | | pairs | .11 | .11 | .10 | .08 | .06 | .05 |
| | 10 | 5 | singles | .18 | .13 | .08 | .06 | .04 | .04 |
| | | | pairs | .18 | .16 | .13 | .10 | .09 | .08 |
| | | 3 | singles | .18 | .15 | .09 | .06 | .05 | .04 |
| | | | pairs | .18 | .18 | .15 | .11 | .09 | .08 |
| | | 5 | singles | .28 | .19 | .10 | .07 | .05 | .04 |
| | | | pairs | .28 | .25 | .18 | .13 | .10 | .08 |
| | | 3 | singles | .34 | .20 | .11 | .07 | .05 | .05 |
| | | | pairs | .34 | .29 | .20 | .15 | .11 | .08 |
| 18 Mk 82 | 14 | 5 | singles | .15 | .12 | .07 | .05 | .04 | .04 |
| | | | pairs | .15 | .14 | .11 | .08 | .07 | .06 |
| | | 3 | singles | .14 | .12 | .08 | .05 | .04 | .03 |
| | | | pairs | .14 | .15 | .13 | .09 | .08 | .07 |
| | 10 | 5 | singles | .23 | .17 | .08 | .05 | .05 | .03 |
| | | | pairs | .23 | .20 | .16 | .10 | .08 | .07 |
| | | 3 | singles | .23 | .17 | .10 | .06 | .04 | .03 |
| | | | pairs | .23 | .22 | .17 | .12 | .09 | .06 |
| | 6 | 5 | singles | .39 | .19 | .09 | .06 | .05 | .04 |
| | | | pairs | .39 | .31 | .19 | .13 | .09 | .07 |
| | | 3 | singles | .43 | .19 | .10 | .06 | .05 | .04 |
| | | | pairs | .43 | .31 | .20 | .13 | .09 | .07 |
| 24 Mk 82 | 14 | 5 | singles | .19 | .13 | .09 | | | |
| | | | pairs | .19 | .18 | .13 | .09 | | |
| | | 3 | singles | .17 | .12 | .07 | | | |
| | | | pairs | .17 | .16 | .13 | .09 | | |
| | 10 | 5 | singles | .29 | .16 | .09 | | | |
| | | | pairs | .29 | .24 | .15 | .10 | | |
| | | 3 | singles | .28 | .17 | .08 | | | |
| | | | pairs | .28 | .29 | .17 | .12 | | |
| | 6 | 5 | singles | .48 | .20 | .10 | | | |
| | | | pairs | .48 | .33 | .20 | .13 | | |
| | | 3 | singles | .51 | .19 | .10 | | | |
| | | | pairs | .51 | .34 | .18 | .12 | | |
| | 14 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 10 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 6 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | | | | | | | |

TABLE 10. Probability of Kill (P$_K$) for Sticks of Mk 82, 83, and 84 Low-Drag Bombs; Effective Target Dimensions = 50 x 50 ft; Probability of Damage, Given a Hit = 1.0; Attack Direction, Parallel to Length.

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 4 MK 82,83,84 | 14 | 5 | singles | .10 | .10 | .11 | .09 | .09 | .08 |
| | | | pairs | .10 | .11 | .11 | .11 | .11 | .11 |
| | | 3 | singles | .10 | .10 | .11 | .11 | .10 | .09 |
| | | | pairs | .10 | .10 | .10 | .11 | .11 | .11 |
| | 10 | 5 | singles | .17 | .16 | .16 | .15 | .13 | .12 |
| | | | pairs | .17 | .17 | .17 | .16 | .16 | .16 |
| | | 3 | singles | .17 | .18 | .18 | .17 | .15 | .13 |
| | | | pairs | .17 | .17 | .17 | .18 | .18 | .18 |
| | 6 | 5 | singles | .32 | .32 | .28 | .24 | .20 | .17 |
| | | | pairs | .32 | .32 | .31 | .30 | .30 | .28 |
| | | 3 | singles | .3. | .37 | .34 | .28 | .23 | .19 |
| | | | pairs | .37 | .37 | .37 | .36 | .34 | .31 |
| 5 MK 82,83,84 | 14 | 5 | singles | .12 | .12 | .12 | .11 | .10 | .09 |
| | | | pairs | .12 | .13 | .13 | .12 | .12 | .11 |
| | | 3 | singles | .11 | .12 | .13 | .12 | .11 | .10 |
| | | | pairs | .11 | .11 | .12 | .13 | .13 | .12 |
| | 10 | 5 | singles | .21 | .21 | .19 | .17 | .14 | .12 |
| | | | pairs | .21 | .21 | .21 | .20 | .19 | .18 |
| | | 3 | singles | .19 | .21 | .21 | .19 | .16 | .13 |
| | | | pairs | .19 | .20 | .21 | .21 | .20 | .19 |
| | 6 | 5 | singles | .38 | .35 | .31 | .25 | .19 | .15 |
| | | | pairs | .38 | .37 | .36 | .32 | .29 | .26 |
| | | 3 | singles | .41 | .42 | .37 | .29 | .23 | .19 |
| | | | pairs | .41 | .42 | .41 | .39 | .35 | .31 |
| 6 MK 82,83,84 | 14 | 5 | singles | .14 | .15 | .13 | .12 | .10 | .09 |
| | | | pairs | .14 | .15 | .15 | .15 | .14 | .13 |
| | | 3 | singles | .12 | .14 | .14 | .14 | .12 | .10 |
| | | | pairs | .12 | .13 | .14 | .15 | .15 | .14 |
| | 10 | 5 | singles | .24 | .23 | .22 | .18 | .15 | .12 |
| | | | pairs | .24 | .24 | .23 | .23 | .22 | .21 |
| | | 3 | singles | .22 | .24 | .23 | ..19 | .15 | .13 |
| | | | pairs | .22 | .23 | .24 | .24 | .23 | .21 |
| | 6 | 5 | singles | .43 | .40 | .33 | .25 | .20 | .16 |
| | | | pairs | .43 | .42 | .40 | .36 | .32 | .28 |
| | | 3 | singles | .45 | .46 | .37 | .28 | .23 | .19 |
| | | | pairs | .45 | .46 | .46 | .43 | .38 | .32 |
| 10 MK 83 | 14 | 5 | singles | .21 | .22 | .18 | .13 | .11 | .09 |
| | | | pairs | .21 | .21 | .21 | .18 | .17 | .15 |
| | | 3 | singles | .19 | .21 | .18 | .14 | .10 | .08 |
| | | | pairs | .19 | .21 | .22 | .19 | .18 | .16 |
| | 10 | 5 | singles | .32 | .30 | .22 | .16 | .12 | .10 |
| | | | pairs | .32 | .32 | .30 | .26 | .21 | .18 |
| | | 3 | singles | .32 | .33 | .24 | .19 | .14 | .12 |
| | | | pairs | .32 | .35 | .32 | .29 | .24 | .21 |
| | 6 | 5 | singles | .54 | .43 | .28 | .21 | .16 | .13 |
| | | | pairs | .54 | .50 | .42 | .34 | .28 | .24 |
| | | 3 | singles | .58 | .49 | .31 | .21 | .19 | .14 |
| | | | pairs | .58 | .59 | .49 | .38 | .30 | .25 |

## TABLE 10. (Contd.)

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 12 MK 82 | 14 | 5 | singles | .24 | .22 | .19 | .13 | .10 | .09 |
| | | | pairs | .24 | .24 | .23 | .20 | .18 | .16 |
| | | 3 | singles | .22 | .22 | .17 | .13 | .09 | .08 |
| | | | pairs | .22 | .24 | .22 | .19 | .17 | .14 |
| | 10 | 5 | singles | .38 | .31 | .22 | .16 | .11 | .10 |
| | | | pairs | .38 | .37 | .30 | .26 | .22 | .19 |
| | | 3 | singles | .35 | .33 | .22 | .15 | .12 | .10 |
| | | | pairs | .35 | .37 | .33 | .27 | .22 | .18 |
| | 6 | 5 | singles | .58 | .42 | .25 | .18 | .14 | .12 |
| | | | pairs | .58 | .53 | .41 | .32 | .25 | .21 |
| | | 3 | singles | .60 | .46 | .26 | .19 | .15 | .13 |
| | | | pairs | .60 | .59 | .45 | .34 | .27 | .21 |
| 18 MK 82 | 14 | 5 | singles | .30 | .28 | .19 | .13 | .11 | .09 |
| | | | pairs | .30 | .31 | .27 | .23 | .18 | .15 |
| | | 3 | singles | .25 | .29 | .20 | .14 | .11 | .09 |
| | | | pairs | .25 | .31 | .29 | .24 | .20 | .17 |
| | 10 | 5 | singles | .45 | .37 | .22 | .15 | .12 | .10 |
| | | | pairs | .45 | .44 | .37 | .27 | .21 | .18 |
| | | 3 | singles | .41 | .38 | .23 | .16 | .12 | .10 |
| | | | pairs | .41 | .46 | .38 | .28 | .22 | .18 |
| | 6 | 5 | singles | .71 | .44 | .24 | .17 | .12 | .11 |
| | | | pairs | .71 | .63 | .44 | .31 | .24 | .20 |
| | | 3 | singles | .70 | .48 | .27 | .18 | .13 | .11 |
| | | | pairs | .70 | .67 | .47 | .34 | .26 | .20 |
| 24 MK 82 | 14 | 5 | singles | .35 | .31 | .19 | | | |
| | | | pairs | .35 | .37 | .31 | .23 | | |
| | | 3 | singles | .28 | .28 | .18 | | | |
| | | | pairs | .28 | .33 | .28 | .22 | | |
| | 10 | 5 | singles | .52 | .37 | .22 | | | |
| | | | pairs | .52 | .51 | .38 | .27 | | |
| | | 3 | singles | .45 | .38 | .22 | | | |
| | | | pairs | .45 | .52 | .37 | .28 | | |
| | 6 | 5 | singles | .79 | .43 | .25 | | | |
| | | | pairs | .79 | .65 | .43 | .31 | | |
| | | 3 | singles | .75 | .44 | .25 | | | |
| | | | pairs | .75 | .66 | .43 | .30 | | |
| | 14 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 10 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 6 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | | | | | | | |

TABLE 11. Probability of Kill ($P_K$) for Sticks of Mk 82, 83, and 84 Low-Drag Bombs; Effective Target Dimensions = 75 x 75 ft; Probability of Damage, Given a Hit = 1.0; Attack Direction, Parallel to Length.

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 4 MK 82,83,84 | 14 | 5 | singles | .20 | .21 | .20 | .19 | .18 | .17 |
| | | | pairs | .20 | .20 | .20 | .21 | .21 | .21 |
| | | 3 | singles | .18 | .19 | .22 | .22 | .21 | .19 |
| | | | pairs | .18 | .18 | .19 | .20 | .21 | .21 |
| | 10 | 5 | singles | .32 | .31 | .31 | .30 | .27 | .23 |
| | | | pairs | .32 | .32 | .31 | .31 | .32 | .31 |
| | | 3 | singles | .30 | .31 | .34 | .32 | .30 | .27 |
| | | | pairs | .30 | .30 | .32 | .33 | .33 | .33 |
| | 6 | 5 | singles | .56 | .56 | .52 | .46 | .39 | .33 |
| | | | pairs | .56 | .56 | .56 | .54 | .52 | .50 |
| | | 3 | singles | .58 | .60 | .59 | .54 | .45 | .40 |
| | | | pairs | .58 | .59 | .60 | .61 | .60 | .57 |
| 5 MK 82,83,84 | 14 | 5 | singles | .24 | .23 | .23 | .22 | .21 | .19 |
| | | | pairs | .24 | .23 | .23 | .23 | .23 | .22 |
| | | 3 | singles | .19 | .21 | .24 | .24 | .23 | .21 |
| | | | pairs | .19 | .20 | .22 | .23 | .24 | .24 |
| | 10 | 5 | singles | .37 | .37 | .36 | .33 | .29 | .25 |
| | | | pairs | .37 | .37 | .37 | .37 | .36 | .35 |
| | | 3 | singles | .33 | .36 | .39 | .37 | .33 | .27 |
| | | | pairs | .33 | .34 | .36 | .37 | .37 | .36 |
| | 6 | 5 | singles | .63 | .61 | .55 | .46 | .38 | .32 |
| | | | pairs | .63 | .62 | .61 | .58 | .53 | .49 |
| | | 3 | singles | .62 | .64 | .62 | .54 | .46 | .39 |
| | | | pairs | .62 | .63 | .64 | .64 | .61 | .56 |
| 6 MK 82,83, 84 | 14 | 5 | singles | .26 | .26 | .25 | .24 | .21 | .19 |
| | | | pairs | .26 | .26 | .26 | .26 | .26 | .25 |
| | | 3 | singles | .21 | .25 | .27 | .27 | .24 | .21 |
| | | | pairs | .21 | .22 | .24 | .26 | .27 | .27 |
| | 10 | 5 | singles | .41 | .40 | .40 | .35 | .30 | .25 |
| | | | pairs | .40 | .40 | .41 | .41 | .41 | .39 |
| | | 3 | singles | .35 | .40 | .42 | .38 | .33 | .28 |
| | | | pairs | .35 | .37 | .40 | .42 | .41 | .40 |
| | 6 | 5 | singles | .68 | .66 | .59 | .49 | .40 | .33 |
| | | | pairs | .68 | .68 | .67 | .64 | .59 | .53 |
| | | 3 | singles | .65 | .69 | .65 | .54 | .44 | .37 |
| | | | pairs | .65 | .67 | .69 | .69 | .65 | .59 |
| 10 MK 83 | 14 | 5 | singles | .36 | .38 | .34 | .27 | .23 | .18 |
| | | | pairs | .36 | .37 | .37 | .36 | .33 | .30 |
| | | 3 | singles | .29 | .35 | .33 | .28 | .23 | .19 |
| | | | pairs | .29 | .33 | .35 | .35 | .34 | .31 |
| | 10 | 5 | singles | .53 | .54 | .42 | .32 | .26 | .22 |
| | | | pairs | .53 | .54 | .54 | .49 | .43 | .37 |
| | | 3 | singles | .47 | .55 | .45 | .36 | .29 | .24 |
| | | | pairs | .47 | .53 | .55 | .51 | .45 | .40 |
| | 6 | 5 | singles | .79 | .71 | .53 | .40 | .32 | .26 |
| | | | pairs | .79 | .77 | .71 | .62 | .53 | .46 |
| | | 3 | singles | .79 | .77 | .56 | .42 | .34 | .29 |
| | | | pairs | .79 | .83 | .78 | .66 | .55 | .47 |

## TABLE 11. (Contd.)

| Weapon | Aiming error, mils | Ballistic dispersion. mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 12 MK 82 | 14 | 5 | singles | .39 | .41 | .35 | .27 | .22 | .18 |
| | | | pairs | .39 | .41 | .41 | .38 | .34 | .30 |
| | | 3 | singles | .33 | .38 | .32 | .25 | .20 | .17 |
| | | | pairs | .33 | .38 | .38 | .35 | .31 | .28 |
| | 10 | 5 | singles | .57 | .55 | .43 | .32 | .25 | .22 |
| | | | pairs | .57 | .58 | .56 | .49 | .42 | .36 |
| | | 3 | singles | .51 | .55 | .42 | .32 | .26 | .23 |
| | | | pairs | .51 | .57 | .55 | .48 | .40 | .36 |
| | 6 | 5 | singles | .82 | .71 | .49 | .37 | .30 | .26 |
| | | | pairs | .82 | .82 | .72 | .59 | .49 | .42 |
| | | 3 | singles | .79 | .74 | .50 | .38 | .32 | .28 |
| | | | pairs | .79 | .84 | .74 | .60 | .50 | .42 |
| 18 MK 82 | 14 | 5 | singles | .44 | .49 | .37 | .28 | .23 | .18 |
| | | | pairs | .44 | .50 | .49 | .44 | .37 | .32 |
| | | 3 | singles | .36 | .51 | .38 | .28 | .24 | .19 |
| | | | pairs | .36 | .46 | .50 | .44 | .38 | .33 |
| | 10 | 5 | singles | .64 | .63 | .42 | .31 | .24 | .20 |
| | | | pairs | .64 | .70 | .63 | .50 | .41 | .36 |
| | | 3 | singles | .55 | .65 | .47 | .34 | .25 | .21 |
| | | | pairs | .55 | .68 | .64 | .54 | .45 | .38 |
| | 6 | 5 | singles | .89 | .75 | .49 | .35 | .28 | .22 |
| | | | pairs | .89 | .88 | .74 | .59 | .48 | .41 |
| | | 3 | singles | .85 | .78 | .52 | .38 | .30 | .24 |
| | | | pairs | .85 | .91 | .78 | .62 | .51 | .43 |
| 24 MK 82 | 14 | 5 | singles | .49 | .51 | .35 | | | |
| | | | pairs | .49 | .56 | .51 | .42 | | |
| | | 3 | singles | .39 | .46 | .33 | | | |
| | | | pairs | .39 | .49 | .46 | .38 | | |
| | 10 | 5 | singles | .68 | .61 | .40 | | | |
| | | | pairs | .68 | .73 | .61 | .48 | | |
| | | 3 | singles | .59 | .58 | .41 | | | |
| | | | pairs | .59 | .70 | .58 | .47 | | |
| | 6 | 5 | singles | .93 | .71 | .47 | | | |
| | | | pairs | .93 | .89 | .70 | .57 | | |
| | | 3 | singles | .88 | .68 | .47 | | | |
| | | | pairs | .88 | .89 | .68 | .55 | | |
| | 14 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 10 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 6 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | | | | | | | |
| | | | | | | | | | |

TABLE 12. Probability of Kill ($P_K$) for Sticks of Mk 82, 83, and
84 Low-Drag Bombs; Effective Target Dimensions = Infinity x
20 ft; Probability of Damage, Given a Hit = 1.0; Attack
Direction, Parallel to Length.

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 4 MK 82,83, 84 | 14 | 5 | singles | .25 | .25 | .25 | .25 | .25 | .25 |
| | | | pairs | .25 | .25 | .25 | .25 | .25 | .25 |
| | | 3 | singles | .24 | .24 | .24 | .24 | .24 | .24 |
| | | | pairs | .24 | .24 | .24 | .24 | .24 | .24 |
| | 10 | 5 | singles | .32 | .32 | .32 | .32 | .32 | .32 |
| | | | pairs | .32 | .32 | .32 | .32 | .32 | .32 |
| | | 3 | singles | .30 | .30 | .30 | .30 | .30 | .30 |
| | | | pairs | .30 | .30 | .30 | .30 | .30 | .30 |
| | 6 | 5 | singles | .44 | .44 | .44 | .44 | .44 | .44 |
| | | | pairs | .44 | .44 | .44 | .44 | .44 | .44 |
| | | 3 | singles | .45 | .45 | .45 | .45 | .45 | .45 |
| | | | pairs | .45 | .45 | .45 | .45 | .45 | .45 |
| 5 MK 82,83,84 | 14 | 5 | singles | .29 | .29 | .29 | .29 | .29 | .29 |
| | | | pairs | .29 | .29 | .29 | .29 | .29 | .29 |
| | | 3 | singles | .27 | .27 | .27 | .27 | .27 | .27 |
| | | | pairs | .27 | .27 | .27 | .27 | .27 | .27 |
| | 10 | 5 | singles | .37 | .37 | .37 | .37 | .37 | .37 |
| | | | pairs | .37 | .37 | .37 | .37 | .37 | .37 |
| | | 3 | singles | .35 | .35 | .35 | .35 | .35 | .35 |
| | | | pairs | .35 | .35 | .35 | .35 | .35 | .35 |
| | 6 | 5 | singles | .50 | .50 | .50 | .50 | .50 | .50 |
| | | | pairs | .50 | .50 | .50 | .50 | .50 | .50 |
| | | 3 | singles | .52 | .52 | .52 | .52 | .52 | .52 |
| | | | pairs | .52 | .52 | .52 | .52 | .52 | .52 |
| 6 MK 82,83,84 | 14 | 5 | singles | .33 | .33 | .33 | .33 | .33 | .33 |
| | | | pairs | .33 | .33 | .33 | .33 | .33 | .33 |
| | | 3 | singles | .30 | .30 | .30 | .30 | .30 | .30 |
| | | | pairs | .30 | .30 | .30 | .30 | .30 | .30 |
| | 10 | 5 | singles | .42 | .42 | .42 | .42 | .42 | .42 |
| | | | pairs | .42 | .42 | .42 | .42 | .42 | .42 |
| | | 3 | singles | .39 | .39 | .39 | .39 | .39 | .39 |
| | | | pairs | .39 | .39 | .39 | .39 | .39 | .39 |
| | 6 | 5 | singles | .56 | .56 | .56 | .56 | .56 | .56 |
| | | | pairs | .56 | .56 | .56 | .56 | .56 | .56 |
| | | 3 | singles | .57 | .57 | .57 | .57 | .57 | .57 |
| | | | pairs | .57 | .57 | .57 | .57 | .57 | .57 |
| 10 MK 83 | 14 | 5 | singles | .46 | .46 | .46 | .46 | .46 | .46 |
| | | | pairs | .46 | .46 | .46 | .46 | .46 | .46 |
| | | 3 | singles | .47 | .47 | .47 | .47 | .47 | .47 |
| | | | pairs | .47 | .47 | .47 | .47 | .47 | .47 |
| | 10 | 5 | singles | .59 | .59 | .59 | .59 | .59 | .59 |
| | | | pairs | .59 | .59 | .59 | .59 | .59 | .59 |
| | | 3 | singles | .59 | .59 | .59 | .59 | .59 | .59 |
| | | | pairs | .59 | .59 | .59 | .59 | .59 | .59 |
| | 6 | 5 | singles | .71 | .71 | .71 | .71 | .71 | .71 |
| | | | pairs | .71 | .71 | .71 | .71 | .71 | .71 |
| | | 3 | singles | .74 | .74 | .74 | .74 | .74 | .74 |
| | | | pairs | .74 | .74 | .74 | .74 | .74 | .74 |

## TABLE 12. (Contd.)

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 12 MK 82 | 14 | 5 | singles | .51 | .51 | .51 | .51 | .51 | .51 |
| | | | pairs | .51 | .51 | .51 | .51 | .51 | .51 |
| | | 3 | singles | .50 | .50 | .50 | .50 | .50 | .50 |
| | | | pairs | .50 | .50 | .50 | .50 | .50 | .50 |
| | 10 | 5 | singles | .63 | .63 | .63 | .63 | .63 | .63 |
| | | | pairs | .63 | .63 | .63 | .63 | .63 | .63 |
| | | 3 | singles | .64 | .64 | .64 | .64 | .64 | .64 |
| | | | pairs | .64 | .64 | .64 | .64 | .64 | .64 |
| | 6 | 5 | singles | .75 | .75 | .75 | .75 | .75 | .75 |
| | | | pairs | .75 | .75 | .75 | .75 | .75 | .75 |
| | | 3 | singles | .80 | .80 | .80 | .80 | .80 | .80 |
| | | | pairs | .80 | .80 | .80 | .80 | .80 | .80 |
| 18 MK 82 | 14 | 5 | singles | .63 | .63 | .63 | .63 | .63 | .63 |
| | | | pairs | .63 | .63 | .63 | .63 | .63 | .63 |
| | | 3 | singles | .61 | .61 | .61 | .61 | .61 | .61 |
| | | | pairs | .61 | .61 | .61 | .61 | .61 | .61 |
| | 10 | 5 | singles | .74 | .74 | .74 | .74 | .74 | .74 |
| | | | pairs | .74 | .74 | .74 | .74 | .74 | .74 |
| | | 3 | singles | .74 | .74 | .74 | .74 | .74 | .74 |
| | | | pairs | .74 | .74 | .74 | .74 | .74 | .74 |
| | 6 | 5 | singles | .87 | .87 | .87 | .87 | .87 | .87 |
| | | | pairs | .87 | .87 | .87 | .87 | .87 | .87 |
| | | 3 | singles | .89 | .89 | .89 | .89 | .89 | .89 |
| | | | pairs | .89 | .89 | .89 | .89 | .89 | .89 |
| 24 MK 82 | 14 | 5 | singles | .69 | .69 | .69 | .69 | .69 | .69 |
| | | | pairs | .69 | .69 | .69 | .69 | .69 | .69 |
| | | 3 | singles | .63 | .63 | .63 | .63 | .63 | .63 |
| | | | pairs | .63 | .63 | .63 | .63 | .63 | .63 |
| | 10 | 5 | singles | .81 | .81 | .81 | .81 | .81 | .81 |
| | | | pairs | .81 | .81 | .81 | .81 | .81 | .81 |
| | | 3 | singles | .80 | .80 | .80 | .80 | .80 | .80 |
| | | | pairs | .80 | .80 | .80 | .80 | .80 | .80 |
| | 6 | 5 | singles | .93 | .93 | .93 | .93 | .93 | .93 |
| | | | pairs | .93 | .93 | .93 | .93 | .93 | .93 |
| | | 3 | singles | .94 | .94 | .94 | .94 | .94 | .94 |
| | | | pairs | .94 | .94 | .94 | .94 | .94 | .94 |
| | 14 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 10 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 6 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |

TABLE 13. Probability of Kill ($P_K$) for Sticks of Mk 82, 83, and
84 Low-Drag Bombs; Effective Target Dimensions = Infinity x
20 ft; Probability of Damage, Given a Hit = 1.0; Attack
Direction, Perpendicular to Length.

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 4 MK 82,83,84 | 14 | 5 | singles | .21 | .22 | .21 | .20 | .19 | .17 |
| | | | pairs | .21 | .20 | .21 | .22 | .21 | .21 |
| | | 3 | singles | .19 | .20 | .21 | .20 | .18 | 17 |
| | | | pairs | .19 | .19 | .20 | .20 | .20 | .21 |
| | 10 | 5 | singles | .27 | .26 | .24 | .23 | .20 | .17 |
| | | | pairs | .27 | .26 | .25 | .26 | .25 | .24 |
| | | 3 | singles | .26 | .27 | .27 | .25 | .22 | .20 |
| | | | pairs | .26 | .26 | .27 | .27 | .27 | .27 |
| | 6 | 5 | singles | .36 | .36 | .32 | .28 | .23 | .18 |
| | | | pairs | .36 | .36 | .36 | .36 | .33 | .30 |
| | | 3 | singles | .39 | .39 | .36 | .30 | .23 | .18 |
| | | | pairs | .39 | .39 | .40 | .39 | .36 | .32 |
| 5 MK 82,83, 84 | 14 | 5 | singles | .25 | .25 | .25 | .22 | .20 | .17 |
| | | | pairs | .25 | .25 | .25 | .24 | .25 | .23 |
| | | 3 | singles | .21 | .23 | .25 | .23 | .21 | .18 |
| | | | pairs | .21 | .22 | .24 | .25 | .25 | .24 |
| | 10 | 5 | singles | .32 | .30 | .29 | .25 | .22 | .18 |
| | | | pairs | .32 | .31 | .31 | .30 | .29 | .27 |
| | | 3 | singles | .30 | .32 | .31 | .27 | .22 | .19 |
| | | | pairs | .30 | .31 | .32 | .32 | .30 | .28 |
| | 6 | 5 | singles | .42 | .41 | .34 | .28 | .22 | .18 |
| | | | pairs | .42 | .42 | .40 | .37 | .33 | .30 |
| | | 3 | singles | .45 | .45 | .37 | .29 | .23 | .20 |
| | | | pairs | .45 | .46 | .44 | .41 | .36 | .32 |
| 6 MK 82,83,84 | 14 | 5 | singles | .28 | .28 | .26 | .24 | .21 | .18 |
| | | | pairs | .28 | .28 | .29 | .28 | .28 | .26 |
| | | 3 | singles | .24 | .27 | .28 | .26 | .22 | .19 |
| | | | pairs | .24 | .25 | .27 | .29 | .29 | .28 |
| | 10 | 5 | singles | .36 | .35 | .32 | .26 | .22 | .19 |
| | | | pairs | .36 | .35 | .35 | .34 | .33 | .31 |
| | | 3 | singles | .34 | .37 | .34 | .28 | .23 | .20 |
| | | | pairs | .34 | .35 | .36 | .37 | .35 | .31 |
| | 6 | 5 | singles | .48 | .45 | .38 | .29 | .23 | .18 |
| | | | pairs | .48 | .47 | .45 | .42 | .37 | .32 |
| | | 3 | singles | .49 | .49 | .39 | .29 | .23 | .18 |
| | | | pairs | .49 | .51 | .50 | .46 | .40 | .34 |
| 10 MK 83 | 14 | 5 | singles | .37 | .41 | .35 | .27 | .22 | .18 |
| | | | pairs | .37 | .40 | .39 | .37 | .35 | .30 |
| | | 3 | singles | .31 | .41 | .35 | .27 | .21 | .18 |
| | | | pairs | .31 | .39 | .41 | .40 | .37 | .32 |
| | 10 | 5 | singles | .50 | .46 | .36 | .28 | .22 | .17 |
| | | | pairs | .50 | .50 | .48 | .43 | .37 | .31 |
| | | 3 | singles | .42 | .51 | .37 | .29 | .23 | .19 |
| | | | pairs | .42 | .50 | .50 | .44 | .37 | .32 |
| | 6 | 5 | singles | .66 | .54 | .35 | .27 | .21 | .18 |
| | | | pairs | .66 | .63 | .55 | .46 | .36 | .32 |
| | | 3 | singles | .63 | .57 | .38 | .28 | .21 | .19 |
| | | | pairs | .63 | .67 | .57 | .45 | .37 | .31 |

## TABLE 13. (Contd.)

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 12 MK 82 | 14 | 5 | singles | .42 | .44 | .38 | .26 | .21 | .16 |
| | | | pairs | .42 | .45 | .44 | .42 | .35 | .31 |
| | | 3 | singles | .35 | .46 | .38 | .28 | .22 | .20 |
| | | | pairs | .35 | .44 | .45 | .43 | .37 | .33 |
| | 10 | 5 | singles | .52 | .51 | .37 | .27 | .22 | .18 |
| | | | pairs | .52 | .56 | .52 | .45 | .36 | .31 |
| | | 3 | singles | .47 | .53 | .39 | .27 | .23 | .20 |
| | | | pairs | .47 | .56 | .53 | .44 | .39 | .33 |
| | 6 | 5 | singles | .70 | .55 | .35 | .28 | .22 | .18 |
| | | | pairs | .70 | .66 | .56 | .46 | .38 | .31 |
| | | 3 | singles | .66 | .60 | .40 | .28 | .23 | .19 |
| | | | pairs | .66 | .70 | .59 | .47 | .37 | .32 |
| 18 MK 82 | 14 | 5 | singles | .49 | .53 | .39 | .29 | .22 | .17 |
| | | | pairs | .49 | .57 | .53 | .45 | .38 | .32 |
| | | 3 | singles | .40 | .55 | .39 | .30 | .23 | .19 |
| | | | pairs | .40 | .56 | .55 | .46 | .39 | .32 |
| | 10 | 5 | singles | .62 | .58 | .39 | .28 | .22 | .18 |
| | | | pairs | .62 | .66 | .59 | .47 | .39 | .32 |
| | | 3 | singles | .52 | .61 | .39 | .29 | .22 | .19 |
| | | | pairs | .52 | .68 | .61 | .48 | .39 | .32 |
| | 6 | 5 | singles | .82 | .62 | .36 | .27 | .21 | .18 |
| | | | pairs | .82 | .78 | .61 | .47 | .38 | .31 |
| | | 3 | singles | .74 | .64 | .38 | .30 | .22 | .19 |
| | | | pairs | .74 | .80 | .61 | .47 | .37 | .32 |
| 24 MK 82 | 14 | 5 | singles | .54 | .59 | .39 | | | |
| | | | pairs | .54 | .66 | .58 | .47 | | |
| | | 3 | singles | .42 | .61 | .41 | | | |
| | | | pairs | .42 | .68 | .60 | .50 | | |
| | 10 | 5 | singles | .67 | .61 | .39 | | | |
| | | | pairs | .67 | .75 | .60 | .47 | | |
| | | 3 | singles | .54 | .61 | .42 | | | |
| | | | pairs | .54 | .78 | .63 | .47 | | |
| | 6 | 5 | singles | .86 | .62 | .37 | | | |
| | | | pairs | .86 | .82 | .60 | .47 | | |
| | | 3 | singles | .77 | .62 | .41 | | | |
| | | | pairs | .77 | .83 | .63 | .48 | | |
| | 14 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 10 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 6 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |

TABLE 14. Probability of Kill ($P_K$) for Sticks of Mk 82, 83, and 84 Low-Drag Bombs; Effective Target Dimensions = 80 x 20 ft; Probability of Damage, Given a Hit = 0.1; Attack Direction, Parallel to Length.

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 4 MK 82,83,84 | 14 | 5 | singles | .01 | .01 | .01 | .01 | .01 | .01 |
| | | | pairs | .01 | .01 | .01 | .01 | .01 | .01 |
| | | 3 | singles | .01 | .01 | .01 | .01 | .01 | .01 |
| | | | pairs | .01 | .01 | .01 | .01 | .01 | .01 |
| | 10 | 5 | singles | .01 | .01 | .01 | .01 | .01 | .01 |
| | | | pairs | .01 | .01 | .01 | .01 | .01 | .01 |
| | | 3 | singles | .01 | .01 | .01 | .01 | .01 | .01 |
| | | | pairs | .01 | .01 | .01 | .01 | .01 | .01 |
| | 6 | 5 | singles | .02 | .02 | .02 | .02 | .01 | .01 |
| | | | pairs | .02 | .02 | .02 | .02 | .02 | .02 |
| | | 3 | singles | .03 | .03 | .03 | .02 | .02 | .01 |
| | | | pairs | .03 | .03 | .03 | .03 | .03 | .02 |
| 5 MK 82,83,84 | 14 | 5 | singles | .01 | .01 | .01 | .01 | .01 | .01 |
| | | | pairs | .01 | .01 | .01 | .01 | .01 | .01 |
| | | 3 | singles | .01 | .01 | .01 | .01 | .01 | .01 |
| | | | pairs | .01 | .01 | .01 | .01 | .01 | .01 |
| | 10 | 5 | singles | .02 | .02 | .01 | .01 | .01 | .01 |
| | | | pairs | .02 | .02 | .02 | .01 | .01 | .01 |
| | | 3 | singles | .02 | .02 | .02 | .01 | .01 | .01 |
| | | | pairs | .02 | .02 | .02 | .02 | .02 | .01 |
| | 6 | 5 | singles | .03 | .03 | .02 | .02 | .01 | .01 |
| | | | pairs | .03 | .03 | .03 | .03 | .02 | .02 |
| | | 3 | singles | .04 | .04 | .03 | .02 | .02 | .01 |
| | | | pairs | .04 | .04 | .04 | .03 | .03 | .02 |
| 6 MK 82,83,84 | 14 | 5 | singles | .01 | .01 | .01 | .01 | .01 | .01 |
| | | | pairs | .01 | .01 | .01 | .01 | .01 | .01 |
| | | 3 | singles | .01 | .01 | .01 | .01 | .01 | .01 |
| | | | pairs | .01 | .01 | .01 | .01 | .01 | .01 |
| | 10 | 5 | singles | .02 | .02 | .02 | .01 | .01 | .01 |
| | | | pairs | .02 | .02 | .02 | .02 | .02 | .02 |
| | | 3 | singles | .02 | .02 | .02 | .01 | .01 | .01 |
| | | | pairs | .02 | .02 | .02 | .02 | .02 | .02 |
| | 6 | 5 | singles | .04 | .03 | .03 | .02 | .01 | .01 |
| | | | pairs | .04 | .04 | .03 | .03 | .03 | .02 |
| | | 3 | singles | .05 | .04 | .03 | .02 | .02 | .01 |
| | | | pairs | .05 | .05 | .04 | .04 | .03 | .02 |
| 10 MK 83 | 14 | 5 | singles | .02 | .02 | .01 | .01 | .01 | .01 |
| | | | pairs | .02 | .02 | .02 | .01 | .01 | .01 |
| | | 3 | singles | .02 | .02 | .01 | .01 | .01 | .01 |
| | | | pairs | .02 | .02 | .02 | .01 | .01 | .01 |
| | 10 | 5 | singles | .03 | .02 | .02 | .01 | .01 | .01 |
| | | | pairs | .03 | .03 | .02 | .02 | .02 | .01 |
| | | 3 | singles | .03 | .03 | .02 | .01 | .01 | .01 |
| | | | pairs | .03 | .03 | .03 | .02 | .02 | .01 |
| | 6 | 5 | singles | .05 | .04 | .02 | .01 | .01 | .01 |
| | | | pairs | .05 | .05 | .03 | .03 | .02 | .02 |
| | | 3 | singles | .06 | .04 | .02 | .01 | .01 | .01 |
| | | | pairs | .06 | .06 | .04 | .03 | .02 | .02 |

TABLE 14. (Contd.)

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 12 Mk 82 | 14 | 5 | singles | .02 | .02 | .01 | .01 | .01 | .00 |
| | | | pairs | .02 | .02 | .02 | .01 | .01 | .01 |
| | | 3 | singles | .02 | .02 | .01 | .01 | .01 | .01 |
| | | | pairs | .02 | .02 | .02 | .02 | .01 | .01 |
| | 10 | 5 | singles | .03 | .03 | .02 | .01 | .01 | .01 |
| | | | pairs | .03 | .03 | .03 | .02 | .02 | .01 |
| | | 3 | singles | .04 | .03 | .02 | .01 | .01 | .01 |
| | | | pairs | .04 | .04 | .03 | .02 | .02 | .01 |
| | 6 | 5 | singles | .06 | .04 | .02 | .01 | .01 | .01 |
| | | | pairs | .06 | .05 | .04 | .03 | .02 | .02 |
| | | 3 | singles | .07 | .04 | .02 | .01 | .01 | .01 |
| | | | pairs | .07 | .06 | .04 | .03 | .02 | .02 |
| 18 Mk 82 | 14 | 5 | singles | .03 | .02 | .01 | .01 | .01 | .01 |
| | | | pairs | .03 | .03 | .02 | .02 | .01 | .01 |
| | | 3 | singles | .03 | .02 | .01 | .01 | .01 | .01 |
| | | | pairs | .03 | .03 | .02 | .02 | .01 | .01 |
| | 10 | 5 | singles | .05 | .03 | .02 | .01 | .01 | .01 |
| | | | pairs | .05 | .04 | .03 | .02 | .02 | .01 |
| | | 3 | singles | .06 | .03 | .02 | .01 | .01 | .01 |
| | | | pairs | .06 | .04 | .03 | .02 | .02 | .01 |
| | 6 | 5 | singles | .08 | .04 | .02 | .01 | .01 | .01 |
| | | | pairs | .08 | .06 | .04 | .02 | .02 | .01 |
| | | 3 | singles | .10 | .04 | .02 | .01 | .01 | .01 |
| | | | pairs | .10 | .07 | .04 | .02 | .02 | .01 |
| 24 Mk 82 | 14 | 5 | singles | .04 | .03 | .01 | | | |
| | | | pairs | .04 | .04 | .03 | .02 | | |
| | | 3 | singles | .04 | .03 | .01 | | | |
| | | | pairs | .04 | .04 | .03 | .02 | | |
| | 10 | 5 | singles | .07 | .03 | .02 | | | |
| | | | pairs | .07 | .05 | .03 | .02 | | |
| | | 3 | singles | .07 | .04 | .02 | | | |
| | | | pairs | .07 | .06 | .03 | .02 | | |
| | 6 | 5 | singles | .11 | .04 | .02 | | | |
| | | | pairs | .11 | .07 | .04 | .03 | | |
| | | 3 | singles | .14 | .04 | .02 | | | |
| | | | pairs | .14 | .07 | .04 | .02 | | |
| | 14 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 10 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 6 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |

TABLE 15. Probability of Kill ($P_K$) for Sticks of Mk 82, 83, and 84 Low-Drag Bombs; Effective Target Dimensions = 80 x 20 ft; Probability of Damage, Given a Hit = 0.1; Attack Direction, Perpendicular to Length.

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 4 MK 82,83,84 | 14 | 5 | singles | .01 | .01 | .01 | .01 | .01 | .01 |
| | | | pairs | .01 | .01 | .01 | .01 | .01 | .01 |
| | | 3 | singles | .01 | .01 | .01 | .01 | .01 | .01 |
| | | | pairs | .01 | .01 | .01 | .01 | .01 | .01 |
| | 10 | 5 | singles | .01 | .01 | .01 | .01 | .01 | .01 |
| | | | pairs | .01 | .01 | .01 | .01 | .01 | .01 |
| | | 3 | singles | .01 | .01 | .01 | .01 | .01 | .01 |
| | | | pairs | .01 | .01 | .01 | .01 | .01 | .01 |
| | 6 | 5 | singles | .02 | .02 | .02 | .02 | .01 | .01 |
| | | | pairs | .02 | .02 | .02 | .02 | .02 | .02 |
| | | 3 | singles | .03 | .03 | .02 | .02 | .01 | .01 |
| | | | pairs | .03 | .03 | .03 | .03 | .03 | .02 |
| 5 MK 82,83,84 | 14 | 5 | singles | .01 | .01 | .01 | .01 | .01 | .01 |
| | | | pairs | .01 | .01 | .01 | .01 | .01 | .01 |
| | | 3 | singles | .01 | .01 | .01 | .01 | .01 | .01 |
| | | | pairs | .01 | .01 | .01 | .01 | .01 | .01 |
| | 10 | 5 | singles | .02 | .02 | .01 | .01 | .01 | .01 |
| | | | pairs | .02 | .02 | .02 | .01 | .01 | .01 |
| | | 3 | singles | .02 | .02 | .02 | .01 | .01 | .01 |
| | | | pairs | .02 | .02 | .02 | .02 | .02 | .01 |
| | 6 | 5 | singles | .03 | .03 | .02 | .02 | .01 | .01 |
| | | | pairs | .03 | .03 | .03 | .02 | .02 | .02 |
| | | 3 | singles | .04 | .03 | .03 | .02 | .01 | .01 |
| | | | pairs | .04 | .04 | .03 | .03 | .03 | .02 |
| 6 MK 82,83 84 | 14 | 5 | singles | .01 | .01 | .01 | .01 | .01 | .01 |
| | | | pairs | .01 | .01 | .01 | .01 | .01 | .01 |
| | | 3 | singles | .01 | .01 | .01 | .01 | .01 | .01 |
| | | | pairs | .01 | .01 | .01 | .01 | .01 | .01 |
| | 10 | 5 | singles | .02 | .02 | .02 | .01 | .01 | .01 |
| | | | pairs | .02 | .02 | .02 | .02 | .02 | .01 |
| | | 3 | singles | .02 | .02 | .02 | .01 | .01 | .01 |
| | | | pairs | .02 | .0? | .02 | .02 | .02 | .02 |
| | 6 | 5 | singles | .03 | .03 | .02 | .02 | .01 | .01 |
| | | | pairs | .03 | .03 | .03 | .03 | .02 | .02 |
| | | 3 | singles | .05 | .04 | .03 | .02 | .02 | .01 |
| | | | pairs | .05 | .04 | .04 | .03 | .03 | .02 |
| 10 MK 83 | 14 | 5 | singles | .02 | .02 | .01 | .01 | .01 | .01 |
| | | | pairs | .02 | .02 | .02 | .01 | .01 | .01 |
| | | 3 | singles | .02 | .02 | .01 | .01 | .01 | .01 |
| | | | pairs | .02 | .02 | .02 | .02 | .01 | .01 |
| | 10 | 5 | singles | .03 | .02 | .02 | .01 | .01 | .01 |
| | | | pairs | .03 | .03 | .02 | .02 | .01 | .01 |
| | | 3 | singles | .03 | .03 | .02 | .01 | .01 | .01 |
| | | | pairs | .03 | .03 | .03 | .02 | .02 | .01 |
| | 6 | 5 | singles | .05 | .03 | .02 | .01 | .01 | .01 |
| | | | pairs | .05 | .04 | .03 | .03 | .02 | .02 |
| | | 3 | singles | .06 | .04 | .02 | .01 | .01 | .01 |
| | | | pairs | .06 | .06 | .04 | .03 | .02 | .02 |

## TABLE 15. (Contd.)

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 12 MK 82 | 14 | 5 | singles | .02 | .02 | .01 | .01 | .01 | .01 |
| | | | pairs | .02 | .02 | .02 | .02 | .01 | .01 |
| | | 3 | singles | .02 | .02 | .01 | .01 | .01 | .01 |
| | | | pairs | .02 | .02 | .01 | .01 | .01 | .01 |
| | 10 | 5 | singles | .03 | .02 | .02 | .01 | .01 | .01 |
| | | | pairs | .03 | .03 | .03 | .02 | .02 | .01 |
| | | 3 | singles | .04 | .03 | .02 | .01 | .01 | .01 |
| | | | pairs | .04 | .03 | .03 | .02 | .02 | .01 |
| | 6 | 5 | singles | .06 | .03 | .02 | .01 | .01 | .01 |
| | | | pairs | .06 | .05 | .03 | .02 | .02 | .01 |
| | | 3 | singles | .07 | .04 | .02 | .01 | .01 | .01 |
| | | | pairs | .07 | .06 | .04 | .03 | .02 | .01 |
| 18 MK 82 | 14 | 5 | singles | .03 | .02 | .01 | .01 | .01 | .00 |
| | | | pairs | .03 | .03 | .02 | .02 | .01 | .01 |
| | | 3 | singles | .03 | .02 | .01 | .01 | .01 | .00 |
| | | | pairs | .03 | .03 | .02 | .02 | .01 | .01 |
| | 10 | 5 | singles | .05 | .03 | .01 | .01 | .01 | .01 |
| | | | pairs | .05 | .04 | .03 | .02 | .01 | .01 |
| | | 3 | singles | .06 | .03 | .02 | .01 | .01 | .01 |
| | | | pairs | .06 | .04 | .03 | .02 | .02 | .01 |
| | 6 | 5 | singles | .08 | .04 | .02 | .01 | .01 | .01 |
| | | | pairs | .08 | .06 | .03 | .02 | .02 | .01 |
| | | 3 | singles | .10 | .04 | .02 | .01 | .01 | .01 |
| | | | pairs | .10 | .06 | .04 | .02 | .02 | .01 |
| 24 MK 82 | 14 | 5 | singles | .04 | .03 | .01 | | | |
| | | | pairs | .04 | .04 | .02 | .02 | | |
| | | 3 | singles | .04 | .03 | .01 | | | |
| | | | pairs | .04 | .04 | .02 | .02 | | |
| | 10 | 5 | singles | .07 | .03 | .02 | | | |
| | | | pairs | .07 | .05 | .03 | .02 | | |
| | | 3 | singles | .07 | .03 | .02 | | | |
| | | | pairs | .07 | .06 | .03 | .02 | | |
| | 6 | 5 | singles | .11 | .04 | .02 | | | |
| | | | pairs | .11 | .07 | .04 | .02 | | |
| | | 3 | singles | .13 | .04 | .02 | | | |
| | | | pairs | .13 | .07 | .04 | .03 | | |
| | 14 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 10 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 6 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | | | | | | | |

TABLE 16. Probability of Kill ($P_K$) for Sticks of Mk 82, 83, and 84 Low-Drag Bombs; Effective Target Dimensions = 80 x 20 ft; Probability of Damage, Given a Hit = 0.5; Attack Direction, Parallel to Length.

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 4 MK 82,83,84 | 14 | 5 | singles | .03 | .04 | .04 | .03 | .03 | .03 |
| | | | pairs | .03 | .04 | .04 | .04 | .04 | .04 |
| | | 3 | singles | .03 | .04 | .04 | .03 | .03 | .03 |
| | | | pairs | .03 | .04 | .04 | .04 | .04 | .04 |
| | 10 | 5 | singles | .06 | .06 | .06 | .05 | .04 | .04 |
| | | | pairs | .06 | .06 | .06 | .06 | .06 | .05 |
| | | 3 | singles | .07 | .06 | .06 | .06 | .05 | .04 |
| | | | pairs | .07 | .06 | .07 | .06 | .06 | .06 |
| | 6 | 5 | singles | .12 | .11 | .10 | .08 | .07 | .05 |
| | | | pairs | .12 | .12 | .12 | .11 | .10 | .10 |
| | | 3 | singles | .15 | .14 | .13 | .10 | .08 | .06 |
| | | | pairs | .15 | .15 | .15 | .14 | .13 | .12 |
| 5 MK 82,83,84 | 14 | 5 | singles | .04 | .04 | .04 | .04 | .03 | .03 |
| | | | pairs | .04 | .04 | .04 | .04 | .04 | .04 |
| | | 3 | singles | .04 | .04 | .04 | .04 | .04 | .03 |
| | | | pairs | .04 | .04 | .04 | .04 | .04 | .04 |
| | 10 | 5 | singles | .08 | .07 | .06 | .05 | .04 | .04 |
| | | | pairs | .08 | .08 | .07 | .07 | .06 | .06 |
| | | 3 | singles | .09 | .08 | .08 | .07 | .05 | .04 |
| | | | pairs | .09 | .08 | .08 | .08 | .07 | .07 |
| | 6 | 5 | singles | .14 | .13 | .11 | .09 | .07 | .05 |
| | | | pairs | .14 | .14 | .13 | .12 | .11 | .09 |
| | | 3 | singles | .18 | .17 | .13 | .10 | .08 | .06 |
| | | | pairs | .18 | .18 | .16 | .15 | .13 | .11 |
| 6 MK 82,83,84 | 14 | 5 | singles | .05 | .05 | .05 | .04 | .03 | .03 |
| | | | pairs | .05 | .05 | .05 | .05 | .05 | .04 |
| | | 3 | singles | .05 | .05 | .05 | .05 | .04 | .03 |
| | | | pairs | .05 | .05 | .05 | .05 | .05 | .05 |
| | 10 | 5 | singles | .09 | .09 | .08 | .06 | .05 | .04 |
| | | | pairs | .09 | .09 | .09 | .08 | .08 | .07 |
| | | 3 | singles | .10 | .09 | .08 | .06 | .05 | .04 |
| | | | pairs | .10 | .09 | .09 | .09 | .08 | .07 |
| | 6 | 5 | singles | .16 | .15 | .12 | .09 | .07 | .06 |
| | | | pairs | .16 | .17 | .15 | .14 | .12 | .10 |
| | | 3 | singles | .21 | .19 | .14 | .10 | .08 | .06 |
| | | | pairs | .21 | .20 | .19 | .17 | .14 | .12 |
| 10 MK 83 | 14 | 5 | singles | .08 | .08 | .06 | .04 | .04 | .03 |
| | | | pairs | .08 | .08 | .07 | .07 | .06 | .05 |
| | | 3 | singles | .09 | .08 | .06 | .05 | .03 | .03 |
| | | | pairs | .09 | .09 | .08 | .07 | .06 | .05 |
| | 10 | 5 | singles | .13 | .11 | .08 | .06 | .04 | .04 |
| | | | pairs | .13 | .12 | .11 | .09 | .08 | .06 |
| | | 3 | singles | .15 | .12 | .08 | .06 | .05 | .03 |
| | | | pairs | .15 | .14 | .12 | .11 | .09 | .07 |
| | 6 | 5 | singles | .23 | .17 | .10 | .07 | .05 | .04 |
| | | | pairs | .23 | .21 | .16 | .13 | .10 | .09 |
| | | 3 | singles | .28 | .19 | .11 | .07 | .05 | .04 |
| | | | pairs | .28 | .25 | .19 | .14 | .11 | .09 |

## TABLE 16. (Contd.)

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 12 MK 82 | 14 | 5 | singles | .09 | .08 | .06 | .05 | .03 | .03 |
| | | | pairs | .09 | .09 | .08 | .07 | .06 | .05 |
| | | 3 | singles | .10 | .09 | .06 | .04 | .03 | .02 |
| | | | pairs | .10 | .10 | .09 | .07 | .06 | .05 |
| | 10 | 5 | singles | .16 | .12 | .08 | .05 | .04 | .03 |
| | | | pairs | .16 | .14 | .12 | .10 | .08 | .06 |
| | | 3 | singles | .17 | .13 | .08 | .05 | .04 | .04 |
| | | | pairs | .17 | .16 | .13 | .10 | .08 | .07 |
| | 6 | 5 | singles | .25 | .16 | .09 | .06 | .05 | .04 |
| | | | pairs | .25 | .22 | .16 | .12 | .09 | .07 |
| | | 3 | singles | .30 | .18 | .09 | .06 | .05 | .04 |
| | | | pairs | .30 | .26 | .17 | .13 | .10 | .08 |
| 18 MK 82 | 14 | 5 | singles | .14 | .10 | .06 | .04 | .03 | .03 |
| | | | pairs | .14 | .12 | .10 | .08 | .06 | .05 |
| | | 3 | singles | .13 | .11 | .07 | .04 | .04 | .03 |
| | | | pairs | .13 | .13 | .11 | .08 | .07 | .06 |
| | 10 | 5 | singles | .21 | .14 | .07 | .05 | .04 | .03 |
| | | | pairs | .21 | .18 | .14 | .10 | .07 | .06 |
| | | 3 | singles | .23 | .15 | .08 | .05 | .04 | .03 |
| | | | pairs | .23 | .20 | .14 | .10 | .08 | .06 |
| | 6 | 5 | singles | .35 | .18 | .09 | .06 | .04 | .03 |
| | | | pairs | .35 | .27 | .17 | .12 | .09 | .07 |
| | | 3 | singles | .39 | .17 | .08 | .05 | .04 | .03 |
| | | | pairs | .39 | .30 | .17 | .12 | .09 | .06 |
| 24 MK 82 | 14 | 5 | singles | .17 | .12 | .06 | | | |
| | | | pairs | .17 | .16 | .12 | .08 | | |
| | | 3 | singles | .16 | .12 | .07 | | | |
| | | | pairs | .16 | .15 | .12 | .09 | | |
| | 10 | 5 | singles | .27 | .15 | .07 | | | |
| | | | pairs | .27 | .22 | .15 | .10 | | |
| | | 3 | singles | .28 | .16 | .08 | | | |
| | | | pairs | .28 | .25 | .16 | .11 | | |
| | 6 | 5 | singles | .44 | .17 | .09 | | | |
| | | | pairs | .44 | .30 | .17 | .12 | | |
| | | 3 | singles | .49 | .17 | .09 | | | |
| | | | pairs | .49 | .32 | .17 | .11 | | |
| | 14 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 10 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 6 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | | | | | | | |

TABLE 17. Probability of Kill (P$_K$) for Sticks of Mk 82, 83, and 84 Low-Drag Bombs; Effective Target Dimensions = 80 x 20 ft; Probability of Damage, Given a Hit = 0.5; Attack Direction, Perpendicular to Length.

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 4 MK 82,83,84 | 14 | 5 | singles | .03 | .04 | .04 | .03 | .03 | .03 |
| | | | pairs | .03 | .03 | .04 | .04 | .04 | .04 |
| | | 3 | singles | .04 | .04 | .04 | .03 | .03 | .03 |
| | | | pairs | .04 | .04 | .04 | .04 | .04 | .04 |
| | 10 | 5 | singles | .06 | .06 | .05 | .05 | .04 | .04 |
| | | | pairs | .06 | .06 | .06 | .06 | .05 | .05 |
| | | 3 | singles | .07 | .06 | .06 | .05 | .04 | .04 |
| | | | pairs | .07 | .07 | .07 | .06 | .06 | .06 |
| | 6 | 5 | singles | .11 | .11 | .09 | .08 | .06 | .05 |
| | | | pairs | .11 | .11 | .11 | .11 | .10 | .09 |
| | | 3 | singles | .14 | .13 | .12 | .10 | .07 | .06 |
| | | | pairs | .14 | .14 | .14 | .13 | .12 | .10 |
| 5 MK 82,83,84 | 14 | 5 | singles | .04 | .04 | .04 | .04 | .03 | .03 |
| | | | pairs | .04 | .04 | .04 | .04 | .04 | .03 |
| | | 3 | singles | .05 | .05 | .05 | .04 | .03 | .03 |
| | | | pairs | .05 | .05 | .05 | .05 | .05 | .04 |
| | 10 | 5 | singles | .08 | .07 | .06 | .05 | .05 | .04 |
| | | | pairs | .08 | .08 | .07 | .07 | .07 | .06 |
| | | 3 | singles | .08 | .08 | .07 | .06 | .05 | .04 |
| | | | pairs | .08 | .08 | .08 | .08 | .07 | .06 |
| | 6 | 5 | singles | .14 | .13 | .10 | .08 | .06 | .05 |
| | | | pairs | .14 | .13 | .12 | .11 | .10 | .09 |
| | | 3 | singles | .17 | .16 | .13 | .10 | .07 | .06 |
| | | | pairs | .17 | .17 | .16 | .14 | .12 | .10 |
| 6 MK 82,83,84 | 14 | 5 | singles | .05 | .05 | .04 | .04 | .03 | .03 |
| | | | pairs | .05 | .05 | .05 | .05 | .05 | .04 |
| | | 3 | singles | .06 | .05 | .05 | .04 | .04 | .03 |
| | | | pairs | .06 | .05 | .06 | .06 | .05 | .05 |
| | 10 | 5 | singles | .09 | .08 | .07 | .06 | .05 | .04 |
| | | | pairs | .09 | .09 | .08 | .08 | .08 | .07 |
| | | 3 | singles | .10 | .10 | .08 | .06 | .05 | .05 |
| | | | pairs | .10 | .10 | .09 | .09 | .08 | .07 |
| | 6 | 5 | singles | .16 | .15 | .12 | .08 | .06 | .05 |
| | | | pairs | .16 | .16 | .15 | .13 | .11 | .10 |
| | | 3 | singles | .20 | .18 | .13 | .09 | .07 | .06 |
| | | | pairs | .20 | .20 | .18 | .16 | .13 | .11 |
| 10 MK 83 | 14 | 5 | singles | .08 | .08 | .06 | .04 | .04 | .03 |
| | | | pairs | .08 | .09 | .08 | .07 | .05 | .05 |
| | | 3 | singles | .09 | .08 | .06 | .04 | .03 | .03 |
| | | | pairs | .09 | .09 | .08 | .07 | .06 | .06 |
| | 10 | 5 | singles | .13 | .10 | .08 | .05 | .04 | .03 |
| | | | pairs | .13 | .12 | .11 | .10 | .07 | .06 |
| | | 3 | singles | .14 | .13 | .07 | .06 | .04 | .04 |
| | | | pairs | .14 | .14 | .12 | .10 | .08 | .06 |
| | 6 | 5 | singles | .23 | .16 | .09 | .07 | .05 | .04 |
| | | | pairs | .23 | .20 | .16 | .12 | .09 | .08 |
| | | 3 | singles | .27 | .18 | .10 | .07 | .05 | .04 |
| | | | pairs | .27 | .24 | .19 | .13 | .10 | .08 |

## TABLE 17. (Contd.)

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 12 MK 82 | 14 | 5 | singles | .09 | .08 | .07 | .04 | .03 | .03 |
| | | | pairs | .09 | .09 | .08 | .07 | .06 | .05 |
| | | 3 | singles | .10 | .09 | .06 | .04 | .03 | .03 |
| | | | pairs | .10 | .10 | .08 | .07 | .06 | .05 |
| | 10 | 5 | singles | .15 | .12 | .08 | .05 | .04 | .03 |
| | | | pairs | .15 | .14 | .12 | .09 | .07 | .06 |
| | | 3 | singles | .17 | .13 | .08 | .05 | .04 | .04 |
| | | | pairs | .17 | .15 | .12 | .09 | .08 | .07 |
| | 6 | 5 | singles | .24 | .16 | .09 | .06 | .05 | .04 |
| | | | pairs | .24 | .22 | .15 | .12 | .09 | .07 |
| | | 3 | singles | .30 | .18 | .10 | .06 | .05 | .04 |
| | | | pairs | .30 | .25 | .18 | .13 | .09 | .07 |
| 18 MK 82 | 14 | 5 | singles | .13 | .10 | .06 | .04 | .03 | .02 |
| | | | pairs | .13 | .12 | .10 | .08 | .06 | .06 |
| | | 3 | singles | .13 | .11 | .06 | .05 | .03 | .02 |
| | | | pairs | .13 | .14 | .11 | .08 | .07 | .06 |
| | 10 | 5 | singles | .21 | .14 | .07 | .05 | .04 | .03 |
| | | | pairs | .21 | .18 | .14 | .09 | .07 | .06 |
| | | 3 | singles | .22 | .15 | .08 | .05 | .04 | .03 |
| | | | pairs | .22 | .20 | .14 | .10 | .08 | .06 |
| | 6 | 5 | singles | .35 | .17 | .08 | .05 | .04 | .03 |
| | | | pairs | .35 | .27 | .16 | .11 | .08 | .06 |
| | | 3 | singles | .39 | .17 | .09 | .06 | .04 | .03 |
| | | | pairs | .39 | .29 | .17 | .12 | .09 | .07 |
| 24 MK 82 | 14 | 5 | singles | .17 | .12 | .07 | | | |
| | | | pairs | .17 | .16 | .11 | .08 | | |
| | | 3 | singles | .16 | .12 | .06 | | | |
| | | | pairs | .16 | .16 | .12 | .08 | | |
| | 10 | 5 | singles | .26 | .14 | .07 | | | |
| | | | pairs | .26 | .22 | .14 | .09 | | |
| | | 3 | singles | .26 | .14 | .08 | | | |
| | | | pairs | .26 | .24 | .15 | .10 | | |
| | 6 | 5 | singles | .43 | .17 | .08 | | | |
| | | | pairs | .43 | .29 | .17 | .11 | | |
| | | 3 | singles | .46 | .17 | .10 | | | |
| | | | pairs | .46 | .31 | .17 | .12 | | |
| | 14 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 10 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 6 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | | | | | | | |

TABLE 18. Probability of Kill ($P_K$) for Sticks of Mk 82, 83, and
84 Low-Drag Bombs; Effective Target Dimensions = 80 x 20 ft;
Probability of Damage, Given a Hit = 1.0; Attack Direction,
Parallel to Length.

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 4 MK 82,83,84 | 14 | 5 | singles | .07 | .07 | .07 | .06 | .06 | .05 |
| | | | pairs | .07 | .07 | .07 | .07 | .07 | .07 |
| | | 3 | singles | .07 | .07 | .07 | .07 | .06 | .06 |
| | | | pairs | .07 | .07 | .07 | .08 | .08 | .07 |
| | 10 | 5 | singles | .12 | .12 | .11 | .10 | .09 | .08 |
| | | | pairs | .12 | .12 | .11 | .11 | .11 | .11 |
| | | 3 | singles | .12 | .12 | .12 | .11 | .10 | .08 |
| | | | pairs | .12 | .12 | .12 | .12 | .12 | .11 |
| | 6 | 5 | singles | .22 | .22 | .19 | .15 | .13 | .11 |
| | | | pairs | .22 | .22 | .22 | .20 | .19 | .18 |
| | | 3 | singles | .27 | .26 | .24 | .19 | .15 | .13 |
| | | | pairs | .27 | .27 | .27 | .26 | .24 | .22 |
| 5 MK 82,83,84 | 14 | 5 | singles | .09 | .09 | .08 | .07 | .07 | .06 |
| | | | pairs | .09 | .09 | .09 | .08 | .08 | .07 |
| | | 3 | singles | .08 | .08 | .08 | .08 | .07 | .06 |
| | | | pairs | .08 | .08 | .08 | .08 | .08 | .08 |
| | 10 | 5 | singles | .15 | .14 | .12 | .11 | .09 | .08 |
| | | | pairs | .15 | .14 | .14 | .13 | .12 | .12 |
| | | 3 | singles | .15 | .15 | .14 | .13 | .10 | .09 |
| | | | pairs | .15 | .14 | .14 | .14 | .13 | .12 |
| | 6 | 5 | singles | .26 | .24 | .21 | .17 | .13 | .11 |
| | | | pairs | .26 | .26 | .24 | .23 | .20 | .18 |
| | | 3 | singles | .31 | .29 | .25 | .20 | .16 | .12 |
| | | | pairs | .31 | .31 | .29 | .27 | .24 | .21 |
| 6 MK 82,83,84 | 14 | 5 | singles | .10 | .10 | .09 | .08 | .07 | .06 |
| | | | pairs | .10 | .10 | .10 | .10 | .09 | .08 |
| | | 3 | singles | .09 | .10 | .09 | .09 | .08 | .06 |
| | | | pairs | .09 | .09 | .10 | .10 | .10 | .09 |
| | 10 | 5 | singles | .17 | .16 | .15 | .12 | .10 | .08 |
| | | | pairs | .17 | .16 | .16 | .16 | .15 | .14 |
| | | 3 | singles | .17 | .16 | .16 | .12 | .10 | .08 |
| | | | pairs | .17 | .16 | .16 | .16 | .15 | .14 |
| | 6 | 5 | singles | .30 | .28 | .23 | .17 | .14 | .11 |
| | | | pairs | .30 | .30 | .28 | .26 | .23 | .19 |
| | | 3 | singles | .35 | .34 | .26 | .20 | .15 | .12 |
| | | | pairs | .35 | .35 | .34 | .31 | .26 | .23 |
| 10 MK 83 | 14 | 5 | singles | .15 | .14 | .12 | .08 | .07 | .06 |
| | | | pairs | .15 | .15 | .14 | .13 | .11 | .10 |
| | | 3 | singles | .15 | .15 | .12 | .09 | .07 | .05 |
| | | | pairs | .15 | .15 | .15 | .13 | .12 | .10 |
| | 10 | 5 | singles | .23 | .20 | .15 | .11 | .08 | .07 |
| | | | pairs | .23 | .22 | .20 | .17 | .15 | .12 |
| | | 3 | singles | .26 | .23 | .16 | .12 | .09 | .07 |
| | | | pairs | .26 | .25 | .22 | .20 | .16 | .14 |
| | 6 | 5 | singles | .41 | .31 | .19 | .13 | .10 | .08 |
| | | | pairs | .41 | .37 | .31 | .25 | .20 | .17 |
| | | 3 | singles | .46 | .35 | .21 | .14 | .10 | .08 |
| | | | pairs | .46 | .44 | .35 | .27 | .20 | .17 |

TABLE 18. (Contd.)

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 12 MK 82 | 14 | 5 | singles | .17 | .15 | .12 | .09 | .07 | .05 |
| | | | pairs | .17 | .16 | .15 | .14 | .12 | .10 |
| | | 3 | singles | .17 | .16 | .12 | .08 | .06 | .05 |
| | | | pairs | .17 | .18 | .16 | .14 | .11 | .09 |
| | 10 | 5 | singles | .28 | .22 | .15 | .10 | .08 | .07 |
| | | | pairs | .28 | .26 | .22 | .18 | .15 | .12 |
| | | 3 | singles | .29 | .24 | .15 | .10 | .08 | .07 |
| | | | pairs | .29 | .29 | .24 | .18 | .15 | .13 |
| | 6 | 5 | singles | .44 | .30 | .18 | .13 | .10 | .08 |
| | | | pairs | .44 | .39 | .31 | .24 | .17 | .14 |
| | | 3 | singles | .49 | .32 | .18 | .12 | .10 | .08 |
| | | | pairs | .49 | .44 | .32 | .23 | .18 | .15 |
| 18 MK 82 | 14 | 5 | singles | .23 | .19 | .12 | .08 | .07 | .05 |
| | | | pairs | .23 | .21 | .18 | .14 | .12 | .10 |
| | | 3 | singles | .21 | .20 | .13 | .09 | .07 | .05 |
| | | | pairs | .21 | .23 | .20 | .16 | .13 | .11 |
| | 10 | 5 | singles | .36 | .26 | .14 | .10 | .08 | .06 |
| | | | pairs | .36 | .33 | .26 | .19 | .14 | .12 |
| | | 3 | singles | .35 | .27 | .15 | .10 | .07 | .06 |
| | | | pairs | .35 | .34 | .27 | .20 | .15 | .12 |
| | 6 | 5 | singles | .56 | .33 | .17 | .12 | .08 | .07 |
| | | | pairs | .56 | .46 | .31 | .22 | .17 | .13 |
| | | 3 | singles | .60 | .31 | .16 | .10 | .08 | .06 |
| | | | pairs | .60 | .51 | .32 | .22 | .16 | .12 |
| 24 MK 82 | 14 | 5 | singles | .27 | .21 | .12 | | | |
| | | | pairs | .27 | .28 | .21 | .15 | | |
| | | 3 | singles | .24 | .20 | .12 | | | |
| | | | pairs | .24 | .24 | .20 | .15 | | |
| | 10 | 5 | singles | .42 | .27 | .14 | | | |
| | | | pairs | .42 | .37 | .27 | .18 | | |
| | | 3 | singles | .41 | .28 | .16 | | | |
| | | | pairs | .41 | .41 | .28 | .20 | | |
| | 6 | 5 | singles | .67 | .32 | .18 | | | |
| | | | pairs | .67 | .50 | .31 | .23 | | |
| | | 3 | singles | .68 | .31 | .16 | | | |
| | | | pairs | .68 | .52 | .30 | .21 | | |
| | 14 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 10 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 6 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | | | | | | | |

TABLE 19. Probability of Kill ($P_K$) for Sticks of Mk 82, 83, and
84 Low-Drag Bombs; Effective Target Dimensions = 80 x 20 ft;
Probability of Damage, Given a Hit = 1.0; Attack Direction,
Perpendicular to Length.

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 4 MK 82,83,84 | 14 | 5 | singles | .07 | .07 | .07 | .07 | .06 | .05 |
| | | | pairs | .07 | .06 | .07 | .07 | .07 | .07 |
| | | 3 | singles | .07 | .07 | .08 | .07 | .06 | .05 |
| | | | pairs | .07 | .07 | .07 | .07 | .07 | .08 |
| | 10 | 5 | singles | .11 | .11 | .10 | .09 | .08 | .07 |
| | | | pairs | .11 | .11 | .11 | .11 | .10 | .10 |
| | | 3 | singles | .12 | .12 | .13 | .11 | .09 | .09 |
| | | | pairs | .12 | .12 | .12 | .13 | .12 | .12 |
| | 6 | 5 | singles | .21 | .21 | .18 | .16 | .13 | .10 |
| | | | pairs | .21 | .20 | .20 | .21 | .19 | .17 |
| | | 3 | singles | .26 | .25 | .22 | .19 | .14 | .11 |
| | | | pairs | .26 | .25 | .25 | .25 | .23 | .20 |
| 5 MK 82,83, 84 | 14 | 5 | singles | .09 | .08 | .08 | .07 | .07 | .05 |
| | | | pairs | .09 | .09 | .09 | .08 | .08 | .07 |
| | | 3 | singles | .08 | .08 | .09 | .08 | .07 | .06 |
| | | | pairs | .08 | .08 | .09 | .09 | .09 | .08 |
| | 10 | 5 | singles | .14 | .13 | .13 | .11 | .09 | .08 |
| | | | pairs | .14 | .14 | .13 | .13 | .13 | .12 |
| | | 3 | singles | .14 | .14 | .14 | .13 | .09 | .07 |
| | | | pairs | .14 | .14 | .15 | .15 | .14 | .12 |
| | 6 | 5 | singles | .26 | .25 | .19 | .16 | .12 | .10 |
| | | | pairs | .26 | .25 | .24 | .21 | .18 | .16 |
| | | 3 | singles | .30 | .29 | .24 | .18 | .14 | .12 |
| | | | pairs | .30 | .30 | .29 | .26 | .23 | .20 |
| 6 MK 82,83,84 | 14 | 5 | singles | .10 | .10 | .08 | .07 | .07 | .06 |
| | | | pairs | .10 | .10 | .10 | .09 | .09 | .08 |
| | | 3 | singles | .10 | .10 | .09 | .08 | .07 | .06 |
| | | | pairs | .10 | .10 | .10 | .11 | .10 | .09 |
| | 10 | 5 | singles | .16 | .15 | .14 | .11 | .09 | .07 |
| | | | pairs | .16 | .16 | .16 | .15 | .15 | .13 |
| | | 3 | singles | .17 | .18 | .15 | .11 | .10 | .09 |
| | | | pairs | .17 | .17 | .17 | .17 | .16 | .14 |
| | 6 | 5 | singles | .30 | .27 | .22 | .16 | .13 | .10 |
| | | | pairs | .30 | .29 | .27 | .24 | .21 | .18 |
| | | 3 | singles | .34 | .33 | .24 | .18 | .14 | .11 |
| | | | pairs | .34 | .34 | .33 | .29 | .25 | .21 |
| 10 MK 83 | 14 | 5 | singles | .15 | .15 | .12 | .08 | .08 | .06 |
| | | | pairs | .15 | .16 | .14 | .13 | .10 | .09 |
| | | 3 | singles | .14 | .15 | .12 | .08 | .07 | .05 |
| | | | pairs | .14 | .15 | .16 | .14 | .12 | .11 |
| | 10 | 5 | singles | .24 | .20 | .15 | .11 | .08 | .06 |
| | | | pairs | .24 | .22 | .21 | .18 | .14 | .11 |
| | | 3 | singles | .24 | .24 | .14 | .12 | .09 | .07 |
| | | | pairs | .24 | .26 | .22 | .18 | .16 | .12 |
| | 6 | 5 | singles | .40 | .29 | .17 | .13 | .10 | .08 |
| | | | pairs | .40 | .36 | .29 | .23 | .18 | .15 |
| | | 3 | singles | .44 | .33 | .20 | .13 | .10 | .09 |
| | | | pairs | .44 | .43 | .34 | .25 | .19 | .15 |

TABLE 19. (Contd.)

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 12 MK 82 | 14 | 5 | singles | .17 | .15 | .13 | .09 | .07 | .06 |
| | | | pairs | .17 | .17 | .15 | .14 | .11 | .10 |
| | | 3 | singles | .17 | .16 | .12 | .08 | .06 | .05 |
| | | | pairs | .17 | .17 | .16 | .14 | .11 | .09 |
| | 10 | 5 | singles | .26 | .22 | .15 | .10 | .07 | .06 |
| | | | pairs | .26 | .26 | .22 | .18 | .14 | .12 |
| | | 3 | singles | .29 | .24 | .16 | .10 | .08 | .07 |
| | | | pairs | .29 | .27 | .23 | .17 | .15 | .13 |
| | 6 | 5 | singles | .43 | .29 | .17 | .12 | .09 | .08 |
| | | | pairs | .43 | .39 | .29 | .22 | .17 | .13 |
| | | 3 | singles | .48 | .33 | .18 | .12 | .09 | .08 |
| | | | pairs | .48 | .43 | .32 | .23 | .17 | .13 |
| 18 MK 82 | 14 | 5 | singles | .22 | .19 | .12 | .09 | .06 | .05 |
| | | | pairs | .22 | .22 | .19 | .15 | .12 | .10 |
| | | 3 | singles | .20 | .21 | .12 | .09 | .06 | .04 |
| | | | pairs | .20 | .25 | .21 | .15 | .13 | .11 |
| | 10 | 5 | singles | .34 | .25 | .14 | .10 | .07 | .06 |
| | | | pairs | .34 | .33 | .26 | .18 | .14 | .12 |
| | | 3 | singles | .33 | .27 | .16 | .10 | .08 | .07 |
| | | | pairs | .33 | .35 | .26 | .20 | .15 | .12 |
| | 6 | 5 | singles | .56 | .32 | .16 | .10 | .08 | .07 |
| | | | pairs | .56 | .47 | .30 | .22 | .16 | .13 |
| | | 3 | singles | .57 | .33 | .18 | .12 | .08 | .07 |
| | | | pairs | .57 | .49 | .32 | .23 | .17 | .14 |
| 24 MK 82 | 14 | 5 | singles | .27 | .22 | .13 | | | |
| | | | pairs | .27 | .28 | .21 | .16 | | |
| | | 3 | singles | .23 | .21 | .12 | | | |
| | | | pairs | .23 | .27 | .21 | .15 | | |
| | 10 | 5 | singles | .41 | .25 | .14 | | | |
| | | | pairs | .41 | .37 | .25 | .18 | | |
| | | 3 | singles | .38 | .26 | .15 | | | |
| | | | pairs | .38 | .40 | .27 | .20 | | |
| | 6 | 5 | singles | .65 | .32 | .16 | | | |
| | | | pairs | .65 | .50 | .31 | .21 | | |
| | | 3 | singles | .64 | .31 | .18 | | | |
| | | | pairs | .64 | .52 | .32 | .22 | | |
| | 14 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 10 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 6 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | | | | | | | |

TABLE 20. Probability of Kill ($P_K$) for Sticks of Mk 82, 83, and
84 Low-Drag Bombs; Effective Target Dimensions = 400 x 40 ft;
Probability of Damage, Given a Hit = 0.1; Attack Direction,
Parallel to Length.

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 4 MK 82,83,84 | 14 | 5 | singles | .05 | .05 | .05 | .05 | .05 | .04 |
| | | | pairs | .05 | .05 | .05 | .05 | .05 | .05 |
| | | 3 | singles | .06 | .06 | .06 | .05 | .05 | .05 |
| | | | pairs | .06 | .06 | .06 | .06 | .06 | .06 |
| | 10 | 5 | singles | .07 | .07 | .07 | .07 | .07 | .06 |
| | | | pairs | .07 | .07 | .07 | .07 | .07 | .07 |
| | | 3 | singles | .08 | .08 | .08 | .07 | .07 | .07 |
| | | | pairs | .08 | .08 | .08 | .08 | .08 | .07 |
| | 6 | 5 | singles | .10 | .10 | .10 | .10 | .10 | .09 |
| | | | pairs | .10 | .10 | .10 | .10 | .10 | .10 |
| | | 3 | singles | .12 | .12 | .12 | .11 | .11 | .11 |
| | | | pairs | .12 | .12 | .12 | .12 | .12 | .12 |
| 5 MK 82,83,84 | 14 | 5 | singles | .06 | .06 | .06 | .06 | .05 | .05 |
| | | | pairs | .06 | .06 | .06 | .06 | .06 | .06 |
| | | 3 | singles | .07 | .07 | .07 | .06 | .06 | .06 |
| | | | pairs | .07 | .07 | .07 | .07 | .07 | .06 |
| | 10 | 5 | singles | .09 | .09 | .09 | .08 | .08 | .07 |
| | | | pairs | .09 | .09 | .09 | .09 | .09 | .08 |
| | | 3 | singles | .10 | .10 | .09 | .09 | .08 | .07 |
| | | | pairs | .10 | .10 | .09 | .09 | .09 | .09 |
| | 6 | 5 | singles | .13 | .13 | .12 | .12 | .11 | .10 |
| | | | pairs | .13 | .13 | .13 | .13 | .12 | .12 |
| | | 3 | singles | .14 | .14 | .14 | .14 | .13 | .12 |
| | | | pairs | .14 | .14 | .14 | .14 | .14 | .14 |
| 6 MK 82,83,84 | 14 | 5 | singles | .08 | .08 | .07 | .07 | .06 | .05 |
| | | | pairs | .08 | .08 | .08 | .07 | .07 | .07 |
| | | 3 | singles | .08 | .08 | .08 | .07 | .07 | .06 |
| | | | pairs | .08 | .08 | .08 | .08 | .08 | .07 |
| | 10 | 5 | singles | .11 | .11 | .10 | .09 | .08 | .07 |
| | | | pairs | .11 | .11 | .11 | .11 | .10 | .10 |
| | | 3 | singles | .11 | .11 | .11 | .10 | .09 | .08 |
| | | | pairs | .11 | .11 | .11 | .11 | .11 | .10 |
| | 6 | 5 | singles | .15 | .15 | .15 | .14 | .12 | .10 |
| | | | pairs | .15 | .15 | .15 | .15 | .15 | .14 |
| | | 3 | singles | .17 | .17 | .17 | .16 | .14 | .12 |
| | | | pairs | .17 | .17 | .17 | .17 | .17 | .16 |
| 10 MK 83 | 14 | 5 | singles | .12 | .11 | .10 | .08 | .07 | .06 |
| | | | pairs | .12 | .12 | .11 | .11 | .10 | .09 |
| | | 3 | singles | .13 | .12 | .11 | .09 | .07 | .06 |
| | | | pairs | .13 | .12 | .12 | .11 | .11 | .10 |
| | 10 | 5 | singles | .16 | .15 | .13 | .11 | .08 | .07 |
| | | | pairs | .16 | .16 | .15 | .14 | .13 | .12 |
| | | 3 | singles | .17 | .17 | .14 | .11 | .09 | .07 |
| | | | pairs | .17 | .17 | .17 | .16 | .14 | .13 |
| | 6 | 5 | singles | .21 | .21 | .18 | .14 | .10 | .08 |
| | | | pairs | .21 | .21 | .21 | .20 | .18 | .16 |
| | | 3 | singles | .23 | .23 | .20 | .15 | .11 | .09 |
| | | | pairs | .23 | .23 | .23 | .22 | .20 | .18 |

TABLE 20. (Contd.)

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 12 MK 82 | 14 | 5 | singles | .14 | .13 | .11 | .08 | .07 | .05 |
| | | | pairs | .14 | .13 | .13 | .12 | .11 | .09 |
| | | 3 | singles | .14 | .13 | .11 | .08 | .06 | .05 |
| | | | pairs | .14 | .14 | .13 | .12 | .11 | .10 |
| | 10 | 5 | singles | .18 | .17 | .14 | .11 | .08 | .06 |
| | | | pairs | .18 | .18 | .17 | .16 | .14 | .12 |
| | | 3 | singles | .20 | .18 | .15 | .11 | .08 | .07 |
| | | | pairs | .20 | .19 | .18 | .17 | .15 | .13 |
| | 6 | 5 | singles | .24 | .23 | .18 | .13 | .09 | .07 |
| | | | pairs | .24 | .23 | .23 | .21 | .18 | .15 |
| | | 3 | singles | .26 | .25 | .20 | .14 | .10 | .08 |
| | | | pairs | .26 | .26 | .25 | .23 | .20 | .16 |
| 18 MK 82 | 14 | 5 | singles | .19 | .17 | .12 | .09 | .06 | .05 |
| | | | pairs | .19 | .19 | .17 | .14 | .12 | .10 |
| | | 3 | singles | .20 | .18 | .13 | .09 | .07 | .06 |
| | | | pairs | .20 | .19 | .18 | .15 | .13 | .11 |
| | 10 | 5 | singles | .25 | .22 | .15 | .10 | .08 | .06 |
| | | | pairs | .25 | .24 | .22 | .18 | .15 | .12 |
| | | 3 | singles | .27 | .23 | .15 | .11 | .08 | .06 |
| | | | pairs | .23 | .26 | .23 | .19 | .15 | .12 |
| | 6 | 5 | singles | .31 | .28 | .17 | .12 | .09 | .07 |
| | | | pairs | .31 | .31 | .28 | .22 | .17 | .14 |
| | | 3 | singles | .34 | .31 | .19 | .13 | .10 | .07 |
| | | | pairs | .34 | .34 | .21 | .24 | .19 | .15 |
| 24 MK 82 | 14 | 5 | singles | .25 | .20 | .12 | | | |
| | | | pairs | .25 | .24 | .20 | .16 | | |
| | | 3 | singles | .25 | .20 | .12 | | | |
| | | | pairs | .25 | .23 | .20 | .15 | | |
| | 10 | 5 | singles | .32 | .25 | .15 | | | |
| | | | pairs | .32 | .30 | .25 | .19 | | |
| | | 3 | singles | .35 | .27 | .16 | | | |
| | | | pairs | .35 | .33 | .27 | .21 | | |
| | 6 | 5 | singles | .41 | .32 | .18 | | | |
| | | | pairs | .41 | .39 | .32 | .23 | | |
| | | 3 | singles | .44 | .35 | .18 | | | |
| | | | pairs | .44 | .43 | .35 | .24 | | |
| | 14 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 10 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 6 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | | | | | | | |

TABLE 21. Probability of Kill (P$_K$) for Sticks of Mk 82, 83, and
84 Low-Drag Bombs; Effective Target Dimensions = 400 x 40 ft;
Probability of Damage, Given a Hit = 0.1; Attack Direction,
Perpendicular to Length.

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 4 MK 82,83,84 | 14 | 5 | singles | .05 | .05 | .04 | .04 | .04 | .03 |
| | | | pairs | .05 | .05 | .05 | .05 | .05 | .04 |
| | | 3 | singles | .05 | .05 | .05 | .04 | .04 | .03 |
| | | | pairs | .05 | .05 | .05 | .05 | .05 | .04 |
| | 10 | 5 | singles | .06 | .06 | .05 | .05 | .04 | .04 |
| | | | pairs | .06 | .06 | .06 | .06 | .06 | .05 |
| | | 3 | singles | .07 | .06 | .06 | .05 | .04 | .04 |
| | | | pairs | .07 | .06 | .06 | .06 | .06 | .06 |
| | 6 | 5 | singles | .08 | .08 | .07 | .06 | .05 | .04 |
| | | | pairs | .08 | .08 | .08 | .08 | .07 | .07 |
| | | 3 | singles | .10 | .09 | .08 | .06 | .05 | .04 |
| | | | pairs | .10 | .10 | .09 | .09 | .08 | .07 |
| 5 MK 82,83,84 | 14 | 5 | singles | .06 | .05 | .05 | .05 | .04 | .03 |
| | | | pairs | .06 | .06 | .06 | .05 | .05 | .05 |
| | | 3 | singles | .06 | .06 | .05 | .05 | .04 | .03 |
| | | | pairs | .06 | .06 | .06 | .06 | .05 | .05 |
| | 10 | 5 | singles | .07 | .07 | .06 | .06 | .05 | .04 |
| | | | pairs | .07 | .07 | .07 | .07 | .06 | .06 |
| | | 3 | singles | .08 | .08 | .07 | .06 | .05 | .04 |
| | | | pairs | .08 | .08 | .08 | .07 | .07 | .06 |
| | 6 | 5 | singles | .11 | .10 | .08 | .06 | .05 | .04 |
| | | | pairs | .11 | .10 | .09 | .08 | .07 | .07 |
| | | 3 | singles | .12 | .11 | .08 | .06 | .05 | .04 |
| | | | pairs | .12 | .12 | .11 | .09 | .08 | .07 |
| 6 MK 82,83,84 | 14 | 5 | singles | .07 | .06 | .06 | .05 | .04 | .04 |
| | | | pairs | .07 | .07 | .07 | .06 | .06 | .06 |
| | | 3 | singles | .07 | .07 | .06 | .05 | .04 | .04 |
| | | | pairs | .07 | .07 | .07 | .07 | .06 | .06 |
| | 10 | 5 | singles | .09 | .08 | .07 | .06 | .05 | .04 |
| | | | pairs | .09 | .09 | .08 | .08 | .07 | .07 |
| | | 3 | singles | .10 | .09 | .07 | .06 | .05 | .04 |
| | | | pairs | .10 | .09 | .09 | .08 | .08 | .07 |
| | 6 | 5 | singles | .12 | .11 | .09 | .06 | .05 | .04 |
| | | | pairs | .12 | .12 | .11 | .10 | .09 | .07 |
| | | 3 | singles | .14 | .12 | .09 | .06 | .05 | .04 |
| | | | pairs | .12 | .14 | .13 | .11 | .09 | .07 |
| 10 MK 83 | 14 | 5 | singles | .10 | .09 | .08 | .05 | .04 | .04 |
| | | | pairs | .10 | .10 | .09 | .08 | .07 | .06 |
| | | 3 | singles | .11 | .10 | .07 | .05 | .04 | .03 |
| | | | pairs | .11 | .11 | .10 | .09 | .08 | .07 |
| | 10 | 5 | singles | .14 | .12 | .08 | .06 | .04 | .04 |
| | | | pairs | .14 | .13 | .12 | .10 | .08 | .07 |
| | | 3 | singles | .14 | .12 | .08 | .06 | .05 | .04 |
| | | | pairs | .14 | .14 | .12 | .10 | .08 | .07 |
| | 6 | 5 | singles | .20 | .14 | .08 | .06 | .04 | .04 |
| | | | pairs | .20 | .17 | .14 | .11 | .08 | .07 |
| | | 3 | singles | .22 | .15 | .08 | .06 | .05 | .04 |
| | | | pairs | .22 | .19 | .15 | .11 | .08 | .07 |

## TABLE 21. (Contd.)

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 12 MK 82 | 14 | 5 | singles | .12 | .11 | .08 | .06 | .04 | .03 |
| | | | pairs | .12 | ·12 | ·11 | ·04 | ·08 | ·07 |
| | | 3 | singles | .13 | .11 | .08 | .06 | .04 | .04 |
| | | | pairs | .13 | .13 | .11 | .10 | .08 | .07 |
| | 10 | 5 | singles | .16 | .13 | .08 | .06 | .04 | .04 |
| | | | pairs | .16 | .15 | .13 | .10 | .08 | .07 |
| | | 3 | singles | .17 | .13 | .08 | .06 | .05 | .04 |
| | | | pairs | .17 | .16 | .14 | .11 | .09 | .07 |
| | 6 | 5 | singles | .22 | .15 | .08 | .06 | .05 | .04 |
| | | | pairs | .22 | .20 | .14 | .11 | .09 | .07 |
| | | 3 | singles | .25 | .15 | .09 | .06 | .05 | .04 |
| | | | pairs | .25 | .21 | .15 | .11 | .09 | .07 |
| 18 MK 82 | 14 | 5 | singles | .17 | .13 | .08 | .06 | .04 | .03 |
| | | | pairs | .17 | .16 | .13 | .10 | .08 | .07 |
| | | 3 | singles | .17 | .14 | .08 | .06 | .04 | .04 |
| | | | pairs | .17 | .17 | .14 | .11 | .08 | .07 |
| | 10 | 5 | singles | .23 | .15 | .09 | .06 | .05 | .04 |
| | | | pairs | .23 | .20 | .15 | .11 | .09 | .07 |
| | | 3 | singles | .23 | .16 | .09 | .06 | .04 | .04 |
| | | | pairs | .23 | .21 | .16 | .11 | .09 | .07 |
| | 6 | 5 | singles | .33 | .16 | .08 | .06 | .04 | .04 |
| | | | pairs | .33 | .25 | .16 | .11 | .08 | .07 |
| | | 3 | singles | .35 | .16 | .09 | .06 | .C5 | .04 |
| | | | pairs | .35 | .26 | .16 | .11 | .08 | .07 |
| 24 MK 82 | 14 | 5 | singles | .21 | .15 | .09 | | | |
| | | | pairs | .21 | .20 | .15 | .11 | | |
| | | 3 | singles | .21 | .15 | .08 | | | |
| | | | pairs | .21 | .21 | .15 | .11 | | |
| | 10 | 5 | singles | .29 | .16 | .09 | | | |
| | | | pairs | .29 | .24 | .16 | .11 | | |
| | | 3 | singles | .28 | .16 | .09 | | | |
| | | | pairs | .28 | .26 | .16 | .12 | | |
| | 6 | 5 | singles | .40 | .16 | .09 | | | |
| | | | pairs | .40 | .27 | .16 | .11 | | |
| | | 3 | singles | .42 | .17 | .09 | | | |
| | | | pairs | .42 | .28 | .16 | .12 | | |
| | 14 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 10 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 6 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | | | | | | | |

TABLE 22. Probability of Kill ($P_K$) for Sticks of Mk 82, 83, and 84 Low-Drag Bombs; Effective Target Dimensions = 400 x 40 ft; Probability of Damage, Given a Hit = 0.5; Attack Direction, Parallel to Length.

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 4 MK 82,83,84 | 14 | 5 | singles | .22 | .22 | .22 | .21 | .20 | .20 |
| | | | pairs | .22 | .22 | .22 | .22 | .22 | .22 |
| | | 3 | singles | .23 | .23 | .22 | .22 | .21 | .20 |
| | | | pairs | .23 | .23 | .23 | .23 | .22 | .22 |
| | 10 | 5 | singles | .31 | .31 | .30 | .30 | .29 | .27 |
| | | | pairs | .31 | .31 | .31 | .31 | .31 | .30 |
| | | 3 | singles | .31 | .31 | .31 | .30 | .29 | .28 |
| | | | pairs | .31 | .31 | .31 | .31 | .31 | .30 |
| | 6 | 5 | singles | .43 | .43 | .43 | .42 | .41 | .39 |
| | | | pairs | .43 | .43 | .43 | .43 | .43 | .43 |
| | | 3 | singles | .46 | .46 | .46 | .45 | .44 | .42 |
| | | | pairs | .46 | .46 | .46 | .46 | .46 | .46 |
| 5 MK 82,83,84 | 14 | 5 | singles | .26 | .26 | .26 | .25 | .23 | .22 |
| | | | pairs | .26 | .26 | .26 | .26 | .25 | .25 |
| | | 3 | singles | .25 | .25 | .25 | .24 | .23 | .22 |
| | | | pairs | .25 | .25 | .25 | .25 | .25 | .24 |
| | 10 | 5 | singles | .36 | .36 | .35 | .34 | .32 | .30 |
| | | | pairs | .36 | .36 | .36 | .36 | .35 | .34 |
| | | 3 | singles | .35 | .35 | .35 | .33 | .32 | .30 |
| | | | pairs | .35 | .35 | .35 | .35 | .34 | .34 |
| | 6 | 5 | singles | .50 | .50 | .49 | .48 | .45 | .41 |
| | | | pairs | .50 | .50 | .50 | .49 | .49 | .48 |
| | | 3 | singles | .52 | .52 | .51 | .51 | .48 | .45 |
| | | | pairs | .52 | .52 | .52 | .52 | .51 | .51 |
| 6 MK 82,83,84 | 14 | 5 | singles | .30 | .29 | .28 | .27 | .25 | .23 |
| | | | pairs | .30 | .30 | .30 | .29 | .29 | .28 |
| | | 3 | singles | .28 | .28 | .28 | .27 | .25 | .23 |
| | | | pairs | .28 | .28 | .28 | .28 | .28 | .27 |
| | 10 | 5 | singles | .41 | .41 | .40 | .37 | .35 | .31 |
| | | | pairs | .41 | .41 | .41 | .40 | .40 | .39 |
| | | 3 | singles | .39 | .39 | .38 | .36 | .34 | .31 |
| | | | pairs | .39 | .39 | .39 | .38 | .38 | .37 |
| | 6 | 5 | singles | .56 | .56 | .55 | .52 | .48 | .42 |
| | | | pairs | .56 | .56 | .56 | .55 | .55 | .54 |
| | | 3 | singles | .57 | .57 | .56 | .55 | .51 | .45 |
| | | | pairs | .57 | .57 | .57 | .57 | .57 | .56 |
| 10 MK 83 | 14 | 5 | singles | .43 | .41 | .38 | .33 | .28 | .24 |
| | | | pairs | .43 | .42 | .41 | .40 | .38 | .36 |
| | | 3 | singles | .42 | .41 | .38 | .34 | .29 | .25 |
| | | | pairs | .42 | .42 | .41 | .40 | .38 | .36 |
| | 10 | 5 | singles | .56 | .55 | .50 | .43 | .35 | .29 |
| | | | pairs | .56 | .56 | .55 | .53 | .50 | .47 |
| | | 3 | singles | .57 | .56 | .51 | .44 | .36 | .30 |
| | | | pairs | .57 | .57 | .56 | .54 | .51 | .48 |
| | 6 | 5 | singles | .70 | .69 | .64 | .53 | .43 | .36 |
| | | | pairs | .70 | .70 | .69 | .67 | .64 | .59 |
| | | 3 | singles | .74 | .74 | .69 | .58 | .46 | .38 |
| | | | pairs | .74 | .74 | .74 | .72 | .69 | .64 |

## TABLE 22. (Contd.)

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 12 MK 82 | 14 | 5 | singles | .47 | .45 | .40 | .34 | .28 | .23 |
| | | | pairs | .47 | .47 | .45 | .43 | .40 | .37 |
| | | 3 | singles | .46 | .44 | .39 | .32 | .26 | .21 |
| | | | pairs | .46 | .46 | .44 | .42 | .39 | .36 |
| | 10 | 5 | singles | .62 | .59 | .52 | .42 | .34 | .28 |
| | | | pairs | .62 | .61 | .59 | .56 | .52 | .47 |
| | | 3 | singles | .62 | .60 | .53 | .42 | .34 | .27 |
| | | | pairs | .62 | .62 | .60 | .57 | .53 | .48 |
| | 6 | 5 | singles | .75 | .73 | .64 | .50 | .40 | .32 |
| | | | pairs | .75 | .74 | .73 | .70 | .64 | .57 |
| | | 3 | singles | .79 | .78 | .68 | .53 | .41 | .32 |
| | | | pairs | .79 | .79 | .78 | .75 | .68 | .60 |
| 18 MK 82 | 14 | 5 | singles | .58 | .55 | .45 | .35 | .28 | .24 |
| | | | pairs | .58 | .57 | .55 | .51 | .45 | .40 |
| | | 3 | singles | .57 | .54 | .46 | .36 | .30 | .25 |
| | | | pairs | .57 | .56 | .54 | .51 | .46 | .41 |
| | 10 | 5 | singles | .73 | .68 | .54 | .42 | .34 | .28 |
| | | | pairs | .73 | .72 | .68 | .62 | .55 | .48 |
| | | 3 | singles | .73 | .68 | .55 | .43 | .35 | .30 |
| | | | pairs | .73 | .72 | .68 | .62 | .55 | .48 |
| | 6 | 5 | singles | .85 | .81 | .63 | .49 | .39 | .32 |
| | | | pairs | .85 | .85 | .81 | .73 | .62 | .55 |
| | | 3 | singles | .88 | .85 | .66 | .52 | .42 | .34 |
| | | | pairs | .88 | .88 | .85 | .76 | .66 | .58 |
| 24 MK 82 | 14 | 5 | singles | .65 | .59 | .44 | | | |
| | | | pairs | .65 | .64 | .60 | .52 | | |
| | | 3 | singles | .59 | .54 | .40 | | | |
| | | | pairs | .59 | .58 | .54 | .47 | | |
| | 10 | 5 | singles | .80 | .71 | .52 | | | |
| | | | pairs | .80 | .77 | .72 | .61 | | |
| | | 3 | singles | .79 | .72 | .52 | | | |
| | | | pairs | .79 | .78 | .72 | .62 | | |
| | 6 | 5 | singles | .92 | .85 | .61 | | | |
| | | | pairs | .92 | .91 | .85 | .73 | | |
| | | 3 | singles | .94 | .87 | .60 | | | |
| | | | pairs | .94 | .93 | .87 | .74 | | |
| | 14 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 10 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 6 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | | | | | | | |

TABLE 23. Probability of Kill ($P_K$) for Sticks of Mk 82, 83, and 84 Low-Drag Bombs; Effective Target Dimensions = 400 x 40 ft; Probability of Damage, Given a Hit = 0.5; Attack Direction Perpendicular to Length.

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 4 MK 82,83,84 | 14 | 5 | singles | .20 | .20 | .20 | .19 | .18 | .16 |
| | | | pairs | .20 | .20 | .20 | .20 | .20 | .20 |
| | | 3 | singles | .19 | .20 | .21 | .20 | .18 | .16 |
| | | | pairs | .19 | .19 | .19 | .20 | .20 | .20 |
| | 10 | 5 | singles | .26 | .26 | .25 | .23 | .20 | .18 |
| | | | pairs | .26 | .26 | .26 | .25 | .25 | .24 |
| | | 3 | singles | .26 | .27 | .27 | .24 | .21 | .19 |
| | | | pairs | .26 | .26 | .27 | .27 | .27 | .26 |
| | 6 | 5 | singles | .36 | .35 | .32 | .27 | .22 | .18 |
| | | | pairs | .36 | .36 | .36 | .34 | .33 | .30 |
| | | 3 | singles | .39 | .39 | .35 | .29 | .23 | .19 |
| | | | pairs | .39 | .39 | .39 | .38 | .36 | .32 |
| 5 MK 82,83,84 | 14 | 5 | singles | .23 | .24 | .23 | .22 | .19 | .17 |
| | | | pairs | .23 | .24 | .24 | .24 | .23 | .22 |
| | | 3 | singles | .21 | .23 | .24 | .23 | .20 | .17 |
| | | | pairs | .21 | .22 | .24 | .24 | .24 | .23 |
| | 10 | 5 | singles | .31 | .31 | .28 | .25 | .21 | .18 |
| | | | pairs | .31 | .31 | .30 | .29 | .28 | .27 |
| | | 3 | singles | .30 | .32 | .31 | .27 | .22 | .18 |
| | | | pairs | .30 | .31 | .32 | .31 | .30 | .27 |
| | 6 | 5 | singles | .42 | .41 | .34 | .28 | .22 | .18 |
| | | | pairs | .42 | .42 | .40 | .37 | .33 | .30 |
| | | 3 | singles | .44 | .44 | .37 | .29 | .23 | .19 |
| | | | pairs | .44 | .45 | .44 | .40 | .36 | .31 |
| 6 MK 82,83,84 | 14 | 5 | singles | .27 | .27 | .26 | .23 | .20 | .17 |
| | | | pairs | .27 | .27 | .27 | .27 | .26 | .25 |
| | | 3 | singles | .24 | .27 | .27 | .25 | .21 | .18 |
| | | | pairs | .24 | .25 | .27 | .28 | .27 | .26 |
| | 10 | 5 | singles | .35 | .35 | .32 | .27 | .22 | .18 |
| | | | pairs | .35 | .35 | .35 | .34 | .32 | .30 |
| | | 3 | singles | .34 | .37 | .34 | .28 | .23 | .19 |
| | | | pairs | .34 | .35 | .36 | .36 | .34 | .31 |
| | 6 | 5 | singles | .49 | .45 | .37 | .29 | .22 | .18 |
| | | | pairs | .49 | .48 | .45 | .42 | .38 | .33 |
| | | 3 | singles | .49 | .49 | .39 | .29 | .22 | .19 |
| | | | pairs | .49 | .50 | .49 | .45 | .39 | .34 |
| 10 MK 83 | 14 | 5 | singles | .36 | .38 | .34 | .25 | .21 | .17 |
| | | | pairs | .36 | .38 | .37 | .36 | .33 | .29 |
| | | 3 | singles | .32 | .40 | .34 | .26 | .21 | .17 |
| | | | pairs | .32 | .37 | .40 | .37 | .34 | .31 |
| | 10 | 5 | singles | .49 | .47 | .36 | .26 | .20 | .17 |
| | | | pairs | .49 | .49 | .48 | .43 | .36 | .31 |
| | | 3 | singles | .43 | .49 | .37 | .28 | .22 | .18 |
| | | | pairs | .43 | .49 | .49 | .43 | .36 | .31 |
| | 6 | 5 | singles | .65 | .54 | .36 | .26 | .21 | .17 |
| | | | pairs | .65 | .62 | .54 | .44 | .37 | .31 |
| | | 3 | singles | .64 | .58 | .37 | .27 | .22 | .18 |
| | | | pairs | .64 | .66 | .57 | .46 | .37 | .31 |

TABLE 23. (Contd.)

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 12 MK 82 | 14 | 5 | singles | .41 | .42 | .35 | .26 | .21 | .17 |
| | | | pairs | .41 | .43 | .42 | .39 | .33 | .30 |
| | | 3 | singles | .36 | .44 | .36 | .27 | .21 | .18 |
| | | | pairs | .36 | .43 | .43 | .40 | .36 | .31 |
| | 10 | 5 | singles | .53 | .50 | .36 | .27 | .21 | .17 |
| | | | pairs | .53 | .54 | .50 | .43 | .36 | .31 |
| | | 3 | singles | .47 | .52 | .38 | .28 | .23 | .18 |
| | | | pairs | .47 | .55 | .53 | .45 | .39 | .32 |
| | 6 | 5 | singles | .69 | .56 | .37 | .27 | .22 | .18 |
| | | | pairs | .69 | .67 | .56 | .45 | .37 | .31 |
| | | 3 | singles | .66 | .59 | .39 | .29 | .23 | .18 |
| | | | pairs | .66 | .69 | .59 | .47 | .39 | .32 |
| 18 MK 82 | 14 | 5 | singles | .48 | .52 | .36 | .27 | .20 | .17 |
| | | | pairs | .48 | .54 | .52 | .43 | .36 | .31 |
| | | 3 | singles | .40 | .53 | .37 | .27 | .21 | .18 |
| | | | pairs | .40 | .54 | .53 | .45 | .37 | .31 |
| | 10 | 5 | singles | .61 | .58 | .38 | .27 | .21 | .17 |
| | | | pairs | .61 | .65 | .58 | .47 | .38 | .32 |
| | | 3 | singles | .53 | .60 | .39 | .28 | .22 | .18 |
| | | | pairs | .53 | .67 | .60 | .48 | .38 | .32 |
| | 6 | 5 | singles | .82 | .61 | .36 | .26 | .21 | .18 |
| | | | pairs | .82 | .78 | .60 | .46 | .37 | .31 |
| | | 3 | singles | .75 | .62 | .38 | .28 | .23 | .19 |
| | | | pairs | .75 | .80 | .61 | .46 | .37 | .31 |
| 24 MK 82 | 14 | 5 | singles | .52 | .57 | .37 | | | |
| | | | pairs | .52 | .63 | .56 | .45 | | |
| | | 3 | singles | .43 | .57 | .38 | | | |
| | | | pairs | .43 | .64 | .58 | .47 | | |
| | 10 | 5 | singles | .68 | .60 | .38 | | | |
| | | | pairs | .68 | .74 | .60 | .46 | | |
| | | 3 | singles | .56 | .61 | .40 | | | |
| | | | pairs | .56 | .76 | .61 | .48 | | |
| | 6 | 5 | singles | .87 | .61 | .38 | | | |
| | | | pairs | .87 | .81 | .61 | .47 | | |
| | | 3 | singles | .79 | .63 | .40 | | | |
| | | | pairs | .79 | .82 | .62 | .48 | | |
| | 14 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 10 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 6 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | | | | | | | |

**TABLE 24.** Probability of Kill ($P_K$) for Sticks of Mk 82, 83, and 84 Low-Drag Bombs; Effective Target Dimensions = 400 x 40 ft; Probability of Damage, Given a Hit = 1.0; Attack Direction, Parallel to Length.

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 4 MK 82,83,84 | 14 | 5 | singles | .38 | .37 | .37 | .36 | .35 | .34 |
| | | | pairs | .38 | .38 | .38 | .37 | .37 | .37 |
| | | 3 | singles | .35 | .35 | .35 | .35 | .34 | .33 |
| | | | pairs | .35 | .35 | .35 | .35 | .35 | .34 |
| | 10 | 5 | singles | .51 | .51 | .50 | .49 | .48 | .46 |
| | | | pairs | .51 | .51 | .51 | .51 | .50 | .50 |
| | | 3 | singles | .47 | .47 | .47 | .46 | .45 | .44 |
| | | | pairs | .47 | .47 | .47 | .47 | .47 | .46 |
| | 6 | 5 | singles | .68 | .68 | .68 | .67 | .66 | .64 |
| | | | pairs | .68 | .68 | .68 | .68 | .68 | .68 |
| | | 3 | singles | .68 | .68 | .67 | .67 | .66 | .64 |
| | | | pairs | .68 | .68 | .68 | .68 | .68 | .67 |
| 5 MK 82,83,84 | 14 | 5 | singles | .42 | .42 | .41 | .40 | .38 | .37 |
| | | | pairs | .42 | .42 | .41 | .41 | .41 | .40 |
| | | 3 | singles | .36 | .36 | .36 | .36 | .35 | .35 |
| | | | pairs | .36 | .36 | .36 | .36 | .36 | .36 |
| | 10 | 5 | singles | .56 | .56 | .55 | .54 | .52 | .49 |
| | | | pairs | .56 | .56 | .56 | .56 | .55 | .54 |
| | | 3 | singles | .50 | .50 | .50 | .49 | .47 | .46 |
| | | | pairs | .50 | .50 | .50 | .50 | .50 | .49 |
| | 6 | 5 | singles | .74 | .74 | .74 | .73 | .70 | .66 |
| | | | pairs | .74 | .74 | .74 | .74 | .74 | .73 |
| | | 3 | singles | .71 | .71 | .71 | .71 | .69 | .66 |
| | | | pairs | .71 | .71 | .71 | .71 | .71 | .71 |
| 6 MK 82,83, 84 | 14 | 5 | singles | .45 | .45 | .44 | .43 | .41 | .38 |
| | | | pairs | .45 | .45 | .45 | .45 | .44 | .44 |
| | | 3 | singles | .39 | .39 | .39 | .38 | .37 | .36 |
| | | | pairs | .39 | .39 | .39 | .39 | .39 | .39 |
| | 10 | 5 | singles | .62 | .61 | .60 | .58 | .54 | .50 |
| | | | pairs | .62 | .61 | .61 | .61 | .60 | .59 |
| | | 3 | singles | .53 | .53 | .53 | .52 | .49 | .47 |
| | | | pairs | .53 | .53 | .53 | .53 | .53 | .52 |
| | 6 | 5 | singles | .80 | .80 | .79 | .77 | .73 | .67 |
| | | | pairs | .80 | .80 | .80 | .79 | .79 | .78 |
| | | 3 | singles | .75 | .75 | .75 | .73 | .71 | .67 |
| | | | pairs | .75 | .75 | .75 | .75 | .75 | .75 |
| 10 MK 83 | 14 | 5 | singles | .60 | .59 | .56 | .51 | .46 | .41 |
| | | | pairs | .60 | .60 | .59 | .58 | .56 | .55 |
| | | 3 | singles | .57 | .57 | .54 | .50 | .46 | .41 |
| | | | pairs | .57 | .57 | .57 | .56 | .54 | .53 |
| | 10 | 5 | singles | .77 | .76 | .73 | .66 | .57 | .50 |
| | | | pairs | .77 | .77 | .76 | .75 | .73 | .70 |
| | | 3 | singles | .75 | .74 | .70 | .65 | .57 | .50 |
| | | | pairs | .75 | .75 | .74 | .73 | .70 | .68 |
| | 6 | 5 | singles | .91 | .90 | .88 | .79 | .69 | .60 |
| | | | pairs | .91 | .91 | .90 | .89 | .88 | .84 |
| | | 3 | singles | .92 | .92 | .89 | .83 | .72 | .61 |
| | | | pairs | .92 | .92 | .92 | .91 | .90 | .87 |

TABLE 24. (Contd.)

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 12 MK 82 | 14 | 5 | singles | .65 | .63 | .60 | .53 | .46 | .39 |
| | | | pairs | .65 | .64 | .63 | .62 | .60 | .57 |
| | | 3 | singles | .60 | .59 | .56 | .50 | .43 | .35 |
| | | | pairs | .60 | .60 | .59 | .58 | .56 | .53 |
| | 10 | 5 | singles | .82 | .80 | .74 | .65 | .55 | .47 |
| | | | pairs | .82 | .81 | .80 | .77 | .75 | .70 |
| | | 3 | singles | .79 | .77 | .73 | .63 | .53 | .43 |
| | | | pairs | .79 | .79 | .77 | .76 | .73 | .68 |
| | 6 | 5 | singles | .94 | .93 | .88 | .76 | .64 | .54 |
| | | | pairs | .94 | .94 | .93 | .91 | .88 | .82 |
| | | 3 | singles | .96 | .95 | .91 | .78 | .64 | .52 |
| | | | pairs | .96 | .96 | .95 | .93 | .90 | .85 |
| 18 MK 82 | 14 | 5 | singles | .73 | .72 | .66 | .56 | .48 | .42 |
| | | | pairs | .73 | .73 | .72 | .70 | .66 | .61 |
| | | 3 | singles | .67 | .68 | .64 | .56 | .50 | .44 |
| | | | pairs | .67 | .68 | .68 | .67 | .64 | .60 |
| | 10 | 5 | singles | .88 | .85 | .77 | .66 | .57 | .49 |
| | | | pairs | .88 | .87 | .85 | .82 | .77 | .71 |
| | | 3 | singles | .84 | .83 | .76 | .67 | .59 | .52 |
| | | | pairs | .84 | .84 | .83 | .80 | .76 | .71 |
| | 6 | 5 | singles | .97 | .96 | .87 | .76 | .65 | .57 |
| | | | pairs | .97 | .97 | .96 | .93 | .87 | .81 |
| | | 3 | singles | .98 | .97 | .90 | .79 | .70 | .60 |
| | | | pairs | .98 | .98 | .97 | .95 | .89 | .84 |
| 24 MK 82 | 14 | 5 | singles | .77 | .74 | .61 | | | |
| | | | pairs | .77 | .76 | .74 | .69 | | |
| | | 3 | singles | .67 | .65 | .54 | | | |
| | | | pairs | .67 | .67 | .65 | .61 | | |
| | 10 | 5 | singles | .90 | .86 | .72 | | | |
| | | | pairs | .90 | .89 | .86 | .80 | | |
| | | 3 | singles | .86 | .83 | .69 | | | |
| | | | pairs | .86 | .86 | .84 | .78 | | |
| | 6 | 5 | singles | .99 | .97 | .83 | | | |
| | | | pairs | .99 | .99 | .97 | .91 | | |
| | | 3 | singles | .98 | .97 | .80 | | | |
| | | | pairs | .98 | .98 | .97 | .91 | | |
| | 14 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 10 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 6 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | | | | | | | |

TABLE 25. Probability of Kill (P$_K$) for Sticks of Mk 82, 83, and 84 Low-Drag Bombs; Effective Target Dimensions = 400 x 40 ft; Probability of Damage, Given a Hit 1.0; Attack Direction, Perpendicular to Length.

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 4 MK 82,83,84 | 14 | 5 | singles | .34 | .35 | .36 | .36 | .33 | .30 |
| | | | pairs | .34 | .34 | .34 | .35 | .36 | .36 |
| | | 3 | singles | .29 | .32 | .37 | .37 | .35 | .32 |
| | | | pairs | .29 | .29 | .31 | .34 | .35 | .35 |
| | 10 | 5 | singles | .44 | .44 | .44 | .42 | .38 | .34 |
| | | | pairs | .44 | .44 | .43 | .43 | .43 | .43 |
| | | 3 | singles | .40 | .44 | .48 | .46 | .42 | .37 |
| | | | pairs | .40 | .43 | .46 | .47 | .47 | .44 |
| | 6 | 5 | singles | .60 | .60 | .56 | .49 | .42 | .35 |
| | | | pairs | .60 | .60 | .60 | .59 | .57 | .53 |
| | | 3 | singles | .57 | .63 | .61 | .54 | .46 | .37 |
| | | | pairs | .57 | .60 | .62 | .64 | .61 | .57 |
| 5 MK 82,83,84 | 14 | 5 | singles | .38 | .39 | .41 | .40 | .37 | .32 |
| | | | pairs | .38 | .39 | .39 | .40 | .41 | .40 |
| | | 3 | singles | .31 | .37 | .42 | .43 | .40 | .34 |
| | | | pairs | .31 | .33 | .38 | .41 | .42 | .42 |
| | 10 | 5 | singles | .49 | .51 | .50 | .47 | .41 | .35 |
| | | | pairs | .49 | .50 | .50 | .50 | .49 | .48 |
| | | 3 | singles | .44 | .50 | .54 | .50 | .42 | .35 |
| | | | pairs | .44 | .46 | .50 | .53 | .52 | .49 |
| | 6 | 5 | singles | .66 | .65 | .59 | .51 | .42 | .34 |
| | | | pairs | .66 | .66 | .65 | .63 | .58 | .53 |
| | | 3 | singles | .64 | .69 | .65 | .53 | .45 | .38 |
| | | | pairs | .64 | .66 | .68 | .67 | .62 | .56 |
| 6 MK 82,83,84 | 14 | 5 | singles | .42 | .44 | .45 | .43 | .38 | .33 |
| | | | pairs | .42 | .43 | .44 | .45 | .46 | .45 |
| | | 3 | singles | .33 | .42 | .48 | .47 | .41 | .35 |
| | | | pairs | .33 | .36 | .42 | .46 | .48 | .46 |
| | 10 | 5 | singles | .53 | .55 | .56 | .49 | .42 | .35 |
| | | | pairs | .53 | .54 | .55 | .56 | .55 | .54 |
| | | 3 | singles | .47 | .56 | .59 | .52 | .45 | .38 |
| | | | pairs | .47 | .49 | .56 | .59 | .58 | .54 |
| | 6 | 5 | singles | .71 | .70 | .63 | .52 | .42 | .36 |
| | | | pairs | .71 | .72 | .71 | .68 | .63 | .56 |
| | | 3 | singles | .67 | .74 | .66 | .54 | .44 | .37 |
| | | | pairs | .67 | .70 | .74 | .73 | .67 | .59 |
| 10 MK 83 | 14 | 5 | singles | .49 | .60 | .57 | .47 | .39 | .34 |
| | | | pairs | .49 | .55 | .58 | .60 | .58 | .52 |
| | | 3 | singles | .41 | .61 | .59 | .49 | .40 | .32 |
| | | | pairs | .41 | .52 | .61 | .63 | .60 | .54 |
| | 10 | 5 | singles | .67 | .71 | .62 | .48 | .39 | .33 |
| | | | pairs | .67 | .70 | .73 | .70 | .61 | .54 |
| | | 3 | singles | .54 | .74 | .65 | .53 | .43 | .36 |
| | | | pairs | .54 | .66 | .75 | .72 | .64 | .56 |
| | 6 | 5 | singles | .86 | .81 | .61 | .48 | .40 | .33 |
| | | | pairs | .86 | .86 | .82 | .71 | .62 | .54 |
| | | 3 | singles | .78 | .85 | .65 | .51 | .43 | .36 |
| | | | pairs | .78 | .87 | .85 | .74 | .64 | .56 |

TABLE 25. (Contd.)

| Weapon | Aiming error, mils | Ballistic dispersion, mils | Singles or pairs | Spacing, ft | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 20 | 40 | 60 | 80 | 100 |
| 12 MK 82 | 14 | 5 | singles | .54 | .65 | .59 | .47 | .39 | .32 |
| | | | pairs | .54 | .61 | .65 | .64 | .58 | .52 |
| | | 3 | singles | .44 | .66 | .62 | .50 | .41 | .35 |
| | | | pairs | .44 | .57 | .66 | .67 | .62 | .56 |
| | 10 | 5 | singles | .68 | .76 | .62 | .48 | .39 | .33 |
| | | | pairs | .68 | .75 | .76 | .70 | .61 | .55 |
| | | 3 | singles | .57 | .79 | .67 | .53 | .44 | .36 |
| | | | pairs | .57 | .72 | .80 | .74 | .66 | .57 |
| | 6 | 5 | singles | .86 | .83 | .62 | .49 | .41 | .35 |
| | | | pairs | .86 | .89 | .83 | .72 | .63 | .56 |
| | | 3 | singles | .77 | .87 | .67 | .54 | .46 | .36 |
| | | | pairs | .77 | .89 | .86 | .76 | .67 | .57 |
| 18 MK 82 | 14 | 5 | singles | .59 | .77 | .62 | .48 | .37 | .33 |
| | | | pairs | .59 | .72 | .77 | .71 | .62 | .54 |
| | | 3 | singles | .46 | .78 | .64 | .51 | .41 | .35 |
| | | | pairs | .46 | .69 | .78 | .73 | .65 | .55 |
| | 10 | 5 | singles | .74 | .84 | .64 | .50 | .41 | .34 |
| | | | pairs | .74 | .84 | .84 | .74 | .64 | .56 |
| | | 3 | singles | .61 | .87 | .67 | .52 | .42 | .36 |
| | | | pairs | .61 | .84 | .87 | .76 | .65 | .56 |
| | 6 | 5 | singles | .93 | .87 | .61 | .48 | .39 | .34 |
| | | | pairs | .93 | .95 | .87 | .73 | .63 | .55 |
| | | 3 | singles | .84 | .89 | .67 | .52 | .45 | .38 |
| | | | pairs | .84 | .97 | .88 | .74 | .64 | .55 |
| 24 MK 82 | 14 | 5 | singles | .62 | .81 | .63 | | | |
| | | | pairs | .62 | .81 | .81 | .71 | | |
| | | 3 | singles | .49 | .83 | .65 | | | |
| | | | pairs | .49 | .80 | .83 | .76 | | |
| | 10 | 5 | singles | .78 | .86 | .64 | | | |
| | | | pairs | .78 | .92 | .85 | .73 | | |
| | | 3 | singles | .63 | .88 | .68 | | | |
| | | | pairs | .63 | .92 | .88 | .78 | | |
| | 6 | 5 | singles | .95 | .87 | .64 | | | |
| | | | pairs | .95 | .97 | .86 | .74 | | |
| | | 3 | singles | .86 | .90 | .69 | | | |
| | | | pairs | .86 | .98 | .88 | .77 | | |
| | 14 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 10 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
| | | 3 | singles | | | | | | |
| | | | pairs | | | | | | |
| | 6 | 5 | singles | | | | | | |
| | | | pairs | | | | | | |
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